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A Model Machine Shop.

Much has been said in the columns of the AMERICAN MACHINIST about a shop system, but no detailed reference has, thus far, been made to any particular shop in which such systems are used.

It was our privilege, recently, to visit the shops of the Brown & Sharpe Manufacturing Co., Providence, R. I., and to spend some time in inspecting the systems there pursued.

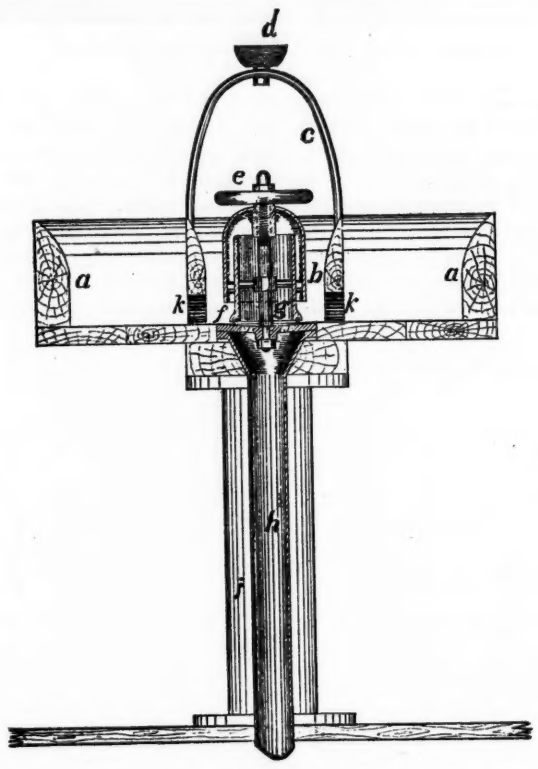
An exterior view of the building is shown in the present issue, and, by the aid of the accompanying illustrations, we will endeavor to explain to our readers how things are arranged, and the manner in which work is done. A brief sketch of this company, from its commencement up to the present time, is first in order.

The machinery branch of the business of the Brown & Sharpe M'f'g Co. was begun in 1833, by David Brown and his son, Joseph R., and has been conducted under the style of David Brown & Son. Joseph R. Brown, J. R. Brown & Sharpe, and is now managed under the style of the Brown & Sharpe M'f'g Co.

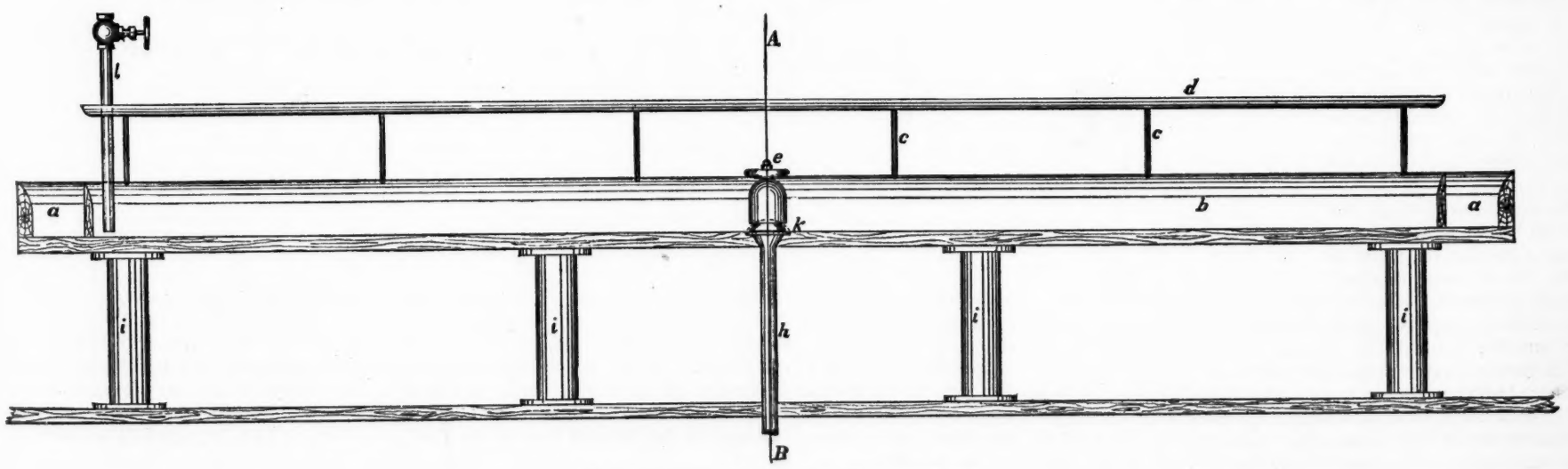
In 1866 the rule and gauge-making branch of J. R. Brown & Sharpe's business combined with Samuel Darling, which added the business formerly known as Darling & Schwartz, of Bangor, Maine.

The new firm adopted the style of Darling, Brown & Sharpe, and have since carried on the manufacture of U. S. Standard rules, Ames's universal squares, patent hardened cast steel try squares, the American standard wire gauge, patent diagraphs, bevel protractors, hardened steel squares, besides a great variety of steel and boxwood rules, scales, and other small tools for the use of machinists, draughtsmen, and workmen in wood. The reader will realize at once, by the foregoing, that there are two distinct concerns occupying the building referred to.

All the workmen enter and retire through the basement door, shown at 4, Fig. 1. On one side is the wardrobe, 2, which the reader may readily understand by the aid of the engravings on the second page. One of these represents a front view, and the other an end view of the wardrobe accommodations for the men. The projections at the top of the frame are for hats; directly under these are hooks for clothing, while at the bottom are other hooks for baskets and pails.



SECTION OF SINK THROUGH LINE A B.



LONGITUDINAL SECTION OF WASHING SINK.

Each man when receiving employment, is given a shop number, which is placed opposite his name on a slip of paper, and inserted in the little receptacle for that purpose, close to each hook. The divisions of the wardrobe are well lighted by gas, and each one is provided with a mirror, leaving nothing to be desired unless it be a "tooth-brush for the shop."

In the space marked 5 (Fig. 1) are a number of peculiar wash sinks for the workmen. This apparatus, which is exhibited by an engraving on this page, consists of a wooden box 19 feet long, 31″ wide, and 8½″ high, by outside measurement. Within this box is placed another box 10″ wide, leaving a space, *a*, of about 8″, at every point, between the inside and the outside box. A soap rack, *d*, is placed above the sink, supported by arches, *c c c*, made of ½″ round iron. The whole is placed upon four iron columns, J, J, J, J. Water is supplied through the pipe *l*, which fills up the space *b*, and runs through the openings *k*, *k* into the space *a*. When full, up to a certain point, the sink is prevented from overflowing by an ingenious device in the valve *e*, by which the surplus water may escape through the opening, *f*, into the drain pipe, *h*. When it is desired to empty the sink, the valve may be opened by turning the wheel, which will be readily understood by an examination of the cut. The object of this arrangement is to provide clean water for each man, for it is expected they will wash their hands in the space *a*, and use the clean water in the space *b* for their faces. Each man has his appointed place for washing up, and there is no stealing of soap and towels, as in some other shops; neither is the floor drenched by the use of water in buckets.

Room 1 (Fig. 1) is occupied by Darling, Brown & Sharpe, to which apartments no visitors are admitted. This room contains scale-graduating machines and other special machinery, the peculiar features of which, as well as original processes, are protected from public use only by secrecy. The stairway 3, is continued to the top of the building. An improved elevator, 6, is so constructed that it may be run fast or slow, and back geared so as to hoist heavy or light weights. The spaces 7 and 14 are occupied for pattern making, and 10 is occupied by castings. Room 8 is used for grinding and polishing; 9 is for storage; 11 for a closet, the latter being is continued, in the same order, to the top floor. The base of the chimney is represented by 12, while 13 is a passage to the blacksmith's shop, which is not shown in our illustrations, as most of the forging is done outside the shop. There are three lines of shafting on this floor.

A peculiar vise bench, of their own designing, is used on every floor throughout the shop, for both iron and wood work. Referring to the illustration, the iron stand, *a a*, is fastened to the floor by a lag screw, and to the wall by wood screws. The standards are placed 8 ft. apart and support the bench *b*, the shelf *g*, the frame work *n*, the shelf *c*, and its accompanying back *d*. The frame-work, *n n*, forms a strong support upon which slides the drawers used for holding files, tools, etc. It also furnishes a place of equal size with the drawer, for holding waste, oil, brush, etc. The walls of the building, B B, support the back of the iron standard, also the steam pipe, *e*, the heat from which passes, as indicated by the arrows, between the windows and the back of the bench. The shelf, *g*, forms a neat support for the gas brackets. A bolt, *h*, with a wheel nut, *i*, is used to hold the vise upon the bench. This is the most substantial vise bench that we have ever seen. In Fig. 2, (first floor) 1 is a room, occupied by D. B. & S; 2 is a staircase; 3, a vestibule and entrance; 4, the time-keeper's room; 5, the superintendent's room, from which speaking tubes and telegraphs communicate with all parts of the building; 6, a private room, with safe; 7, the treasurer's room; 8, general office, which is light, roomy and pleasant; 9, are cases which contain a library embracing nearly 1,000 volumes, and which was noticed in our issue of August 16th last. The books contained in this library are for the use of the employees, and do not treat upon scientific subjects exclusively, but upon all branches of literature.

This is probably the finest library in any machine shop in the country. The firm of D. B. & S. have seen the advantages of employing men who are ambitious to advance themselves in their business, and then furnishing them the proper books for that purpose. Additions are constantly made of the best publications as fast as they are issued.

The main entrance is marked 10; 11 is a

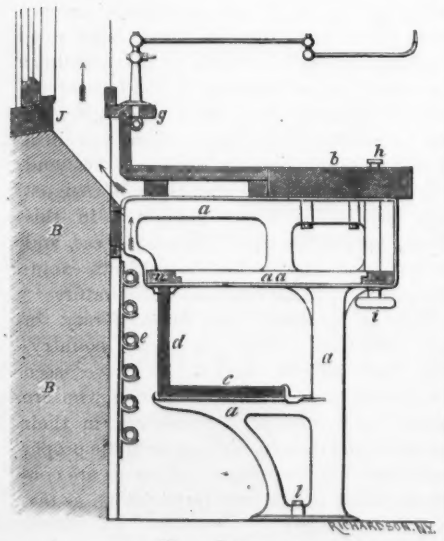
store room for small tools; 12, a wash room and closet for the office; 13, a closet for, and appliances for gear cutters; 14, a space occupied by drill presses; 15, a space for engine and hand lathes: 16, is occupied by milling machines, and 17 by planers; 18, by a large screw motion planer; 19, by a closet; 20, by boilers for stationary engine; 21, is the boiler room; 22, a room in which all the case hardening and annealing is done, occupied by the most improved appliances for those purposes; 23, is the engine room, a specimen of neatness and skill; 24 and 25 are spaces occupied by hand and engine lathes: 26, is the elevator. There are three lines of shafting on this floor. O, represents vise benches. The second floor is represented by Fig. 3, in which 1 is a room occupied by D.B.& S., 2, 2 2 spaces for drill presses, hand lathes, and surface grinders; 3, a staircase; 4, a private room; 5, drawing-room, with three tables and a large case of drawers for drawings; 6, a space occupied by gear-cutters; 7, universal milling machines; 8, milling machines and gear-cutters; 9, an automatic gear-cutter. This machine is thoroughly automatic, and works with great precision. The space 10, is for engine and hand lathes; 11, is elevator; 12, a space for planers; 13, location of drill presses; 14, closet; 15, tool-room.

As was previously stated, when a new man comes to work he is furnished with a set of tools, an inventory of which is entered on a little blank kept for that purpose in the tool-room, and when that man leaves the employ of the company, he is expected to account for each tool given him.

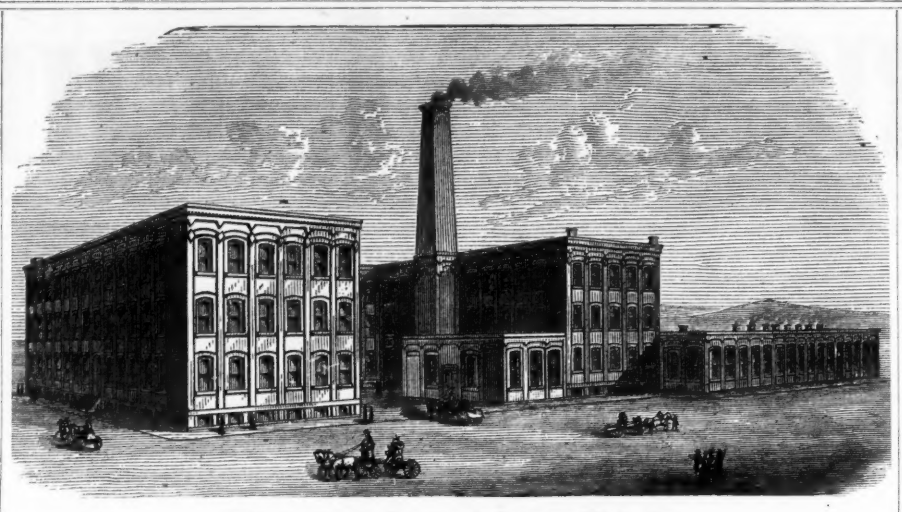
He is also presented with ten brass checks which are marked with his shop number, and when a tool is required, he takes one of these checks to the window of the tool-room and the man in charge gives him the tool required, and places the check in its place.

A register board is kept in the tool-room, and if the tool is in use, and it becomes necessary to know where that particular tool is, it can be ascertained at once by consulting the register and comparing the numbers with the checks. There are also extra checks kept in the tool-room, and when a man comes for oil, waste, or files, one of these duplicate checks is deposited in a little box, a number of which are kept for the different articles, or supplies, required. At the end of the week the checks are examined, when it is ascertained who uses the most waste, files, etc., and the amount used. The bolts for use about the shop are all made with a standard size head and nut, therefore a standard set of wrenches can be used which will fit any or all nuts on bolts of the same size.

The decimal system is used for precise measurements, which is the nearest perfect that can be employed in any machine shop.



Vise Bench.



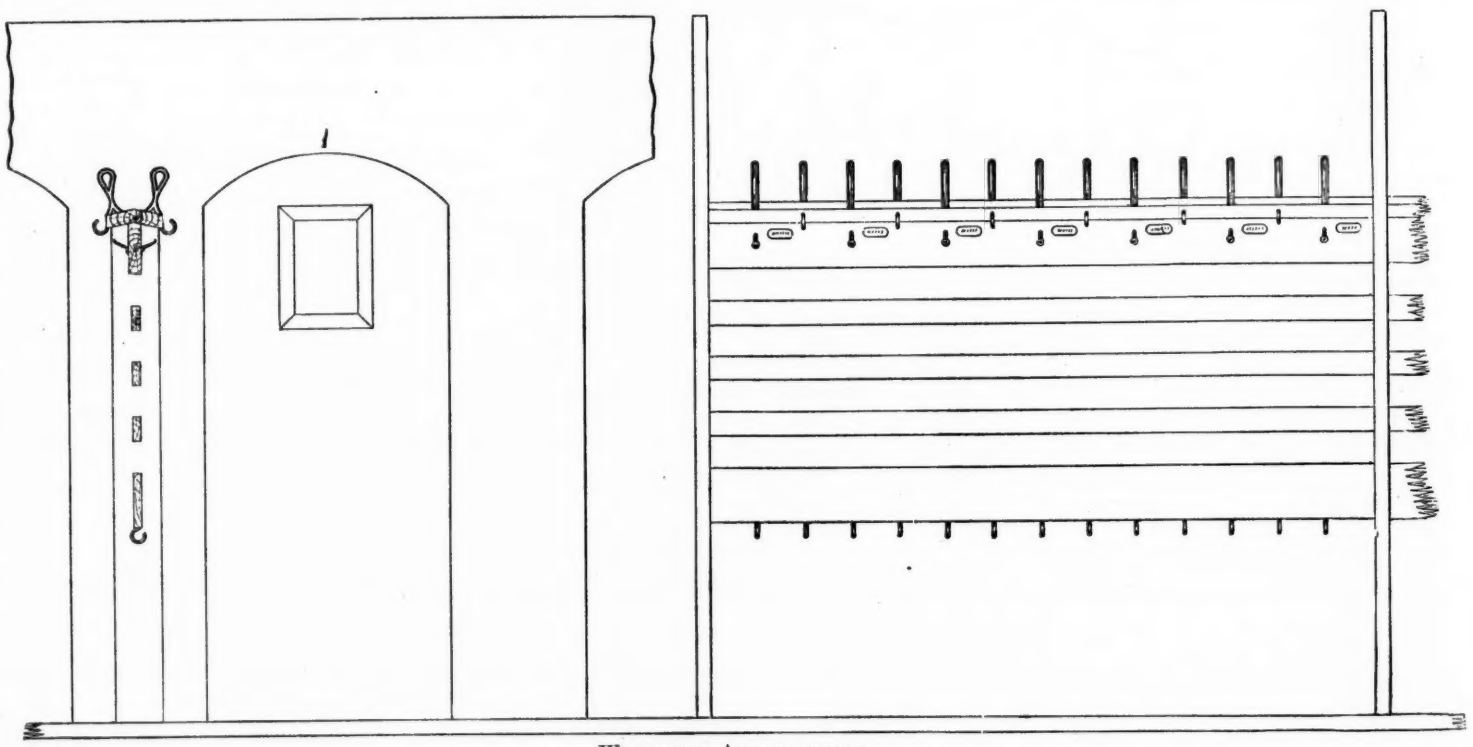
Works of the Brown & Sharpe M'f'g Co.

A "scant" thirty-second, or a "full" sixty-fourth of an inch is of no value in a shop like this, for everything must be positive, and expressed in plain figures.

An apparatus is now in course of construction, by which a variation of $\frac{1}{250000}$ of an inch may be detected. None of the men are allowed to go to the tool maker to get a tool dressed, as duplicates are always kept in the tool room. 16 is location of engine lathes. The space marked 17 is a model room, 18, an experimental-room, and 19, storage.

The third floor, represented by Fig. 4, contains the inspecting room, 1, where each tool and every part of machinery is taken for inspection; 2 2, the assembling room, where each of the parts are put together and the finishing part completed; and 3, the staircase by which the roof is reached. The roof may easily be reached in case it becomes necessary. A private room is shown at 4, and a space occupied by drill lathes and polishing lathes at 5. This floor is used for the manufacture of the Wilcox & Gibbs sewing machine, the workmanship of which is well-known. The machinery used in the manufacture of these machines was also invented by the mechanics of this company, who have already made in the neighborhood of 300,000 for the market. At 6 is shown location of Universal milling machines, hand lathes, tapping machines and grinding lathes; 7, milling machines; 8, screw machines; 9, power presses, lathes and milling machines; 10, drill presses and planers; 11, elevator; 12, closet; 13, store room; 14, buffing room; 15, nickel-plating room.

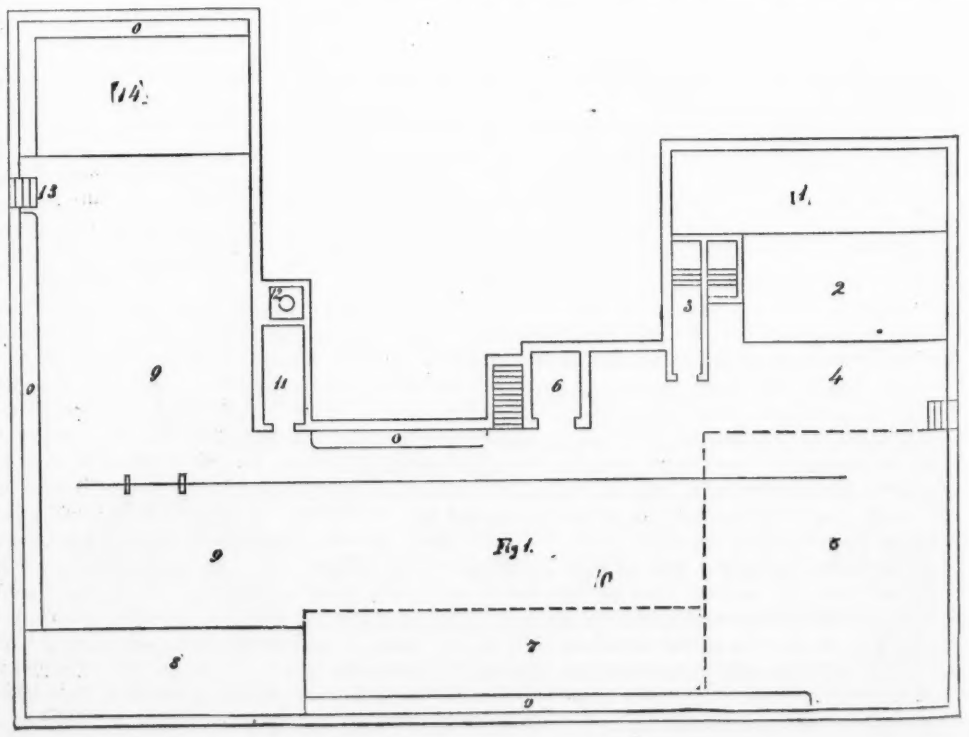
There are two lines of shafting on this floor. The bearings on the different lines of shafting are self-oiling, in which the best sperm oil is used, and once every year the oil is taken out, strained, put back into the box, and a little more added, when necessary. They are then left to take care of themselves for another year. This is what we call true economy in the use of lubricants. There is no unnecessary loss of power, and the floor and shaft hangers are not saturated with a mass of filth and gum, which is, in some shops, erroneously called lubricating oil. The roof, unlike other roofs, instead of sloping towards the walls, slopes towards the center. All the water from the roof passes through an aperture in the center of the roof, and is carried through the columns that support the different floors to the drain under the basement. The object of this arrangement is to avoid the nuisance of leaky gutters and the damage done by freezing up in cold weather. The building is fireproof from basement to roof, and has a floor area of about 60,000 feet, and is well adapted to the purpose for which it was built. The proprietors, after searching the country, and examining the plans of different shops, designed the present one.



Wardrobe Arrangement.

The appliance for furnishing ice water to the shop is worthy of notice: It consists of a coil of pipe in a large ice box, through which all the water must pass to supply the different floors with drinking water.

The efforts of this establishment have always been directed to one point, viz., to furnish a class of machinery and small tools which shall attain the nearest approximation to perfection. The gauge system is carried to its fullest extent in this shop, and all the different parts of the machines and tools are perfectly interchangeable All persons, upon receiving employment at this shop are presented with a copy of the rules and regulations of the establishment, from which we quote the following: "These regulations are considered a part of the contract with every person in our employ; therefore, no one may complain of discharge for non-observance of them. All persons in our employ are entitled to the free use of the library, subject to the rules of the same. When industry, energy and economy characterize an employee, he will merit and receive the confidence of the company, and his interests will be advanced



as opportunity presents. Civility of intercourse between workmen and the keeper of the tool room; also between blacksmiths and machine shop employees, will be considered indispensable. The foregoing rules and regulations are established alike for the benefit of employer and employees, and it is hoped that each and every man will act well his part in their proper maintenance, so that the right discipline may be observed."

A woman died in Richmond, Va., a short time ago, who had chosen the blacksmith's forge as a means of earning a living. Her name was Rachel Yent. Her father came to this country from Germany, and opened a blacksmith's shop in Richmond. She learned the trade in her girlhood, and became as good a worker as any man. As her father grew old she took control of the shop, and supported the family by her own labor. She wore a tight-fitting woolen dress and a blacksmith's leather apron, and frequently smoked a short clay pipe as she toiled. When the old man died she still stuck to the trade, but a few months ago she grew enfeebled, and rapidly sunk. Her work had given her in her best days, the muscular strength of a man. She had eligible offers of marriage when young, but preferred to remain single and provide for the family.

While business is improving rapidly on this side of the Atlantic and wages of workmen advancing, the situation in England shows a decided contrast. The following is taken from the *Ironmonger* of Sept. 13 :—"The Mayor of Manchester, acting as arbitrator, has decided that there is just cause for a reduction of ¼*d.* per hour in the wages of the operative house-painters of Manchester and Salford. On Saturday last notices were posted at some of the pits belonging to the Parkend Coal Company, Forest of Dean, of a further reduction of wages, to the extent of 10 per cent. The notice affects 700 men and boys, who accepted a 5 per cent. reduction two months ago. About 1,000 of Messrs. Stainer's colliers, in the North Staffordshire district, remain out on strike. They will accept a 5 per cent. reduction, but not more. At an open-air meeting of nailmakers at Bromsgrove, on Monday, it was resolved to commence a strike forthwith against the further attempted reduction of 10 per cent. in wages. The Great Western Railway Company are about to reduce the wages of the enginemen and firemen in their employ. At a meeting of men engaged in the London engineering trade, on Saturday last, the secretary submitted the weekly report, in which the following statement appeared : 'We were promised substantial aid and support from all quarters, but as time passed on we found that our hopes were in vain, and hence it followed that our financial position would not permit us to continue the successful course we had begun.' It transpired that the men were still paid 7*s.* 6*d.* a week, with 1*s.* for each child; and, after a resolution denouncing those who had not supported the strike being passed, the meeting closed. It appeared, in the course of the discussion, that there were now 300 men on the books out of the 1,000 who originally struck. A mass meeting of unemployed ironworkers was held at Middlesborough on Thursday. Nearly 1,000 persons were present. Resolutions were passed appointing a committee to confer with a committee of the Board of Guardians as to the best means of alleviating the existing distress."

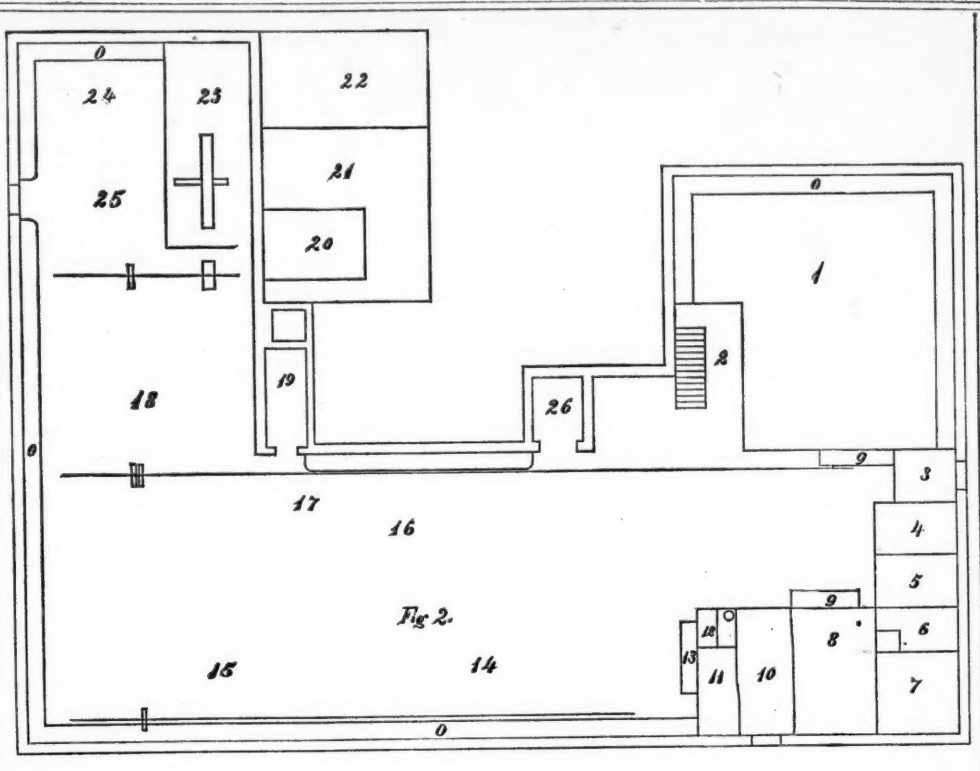


Fig 2.

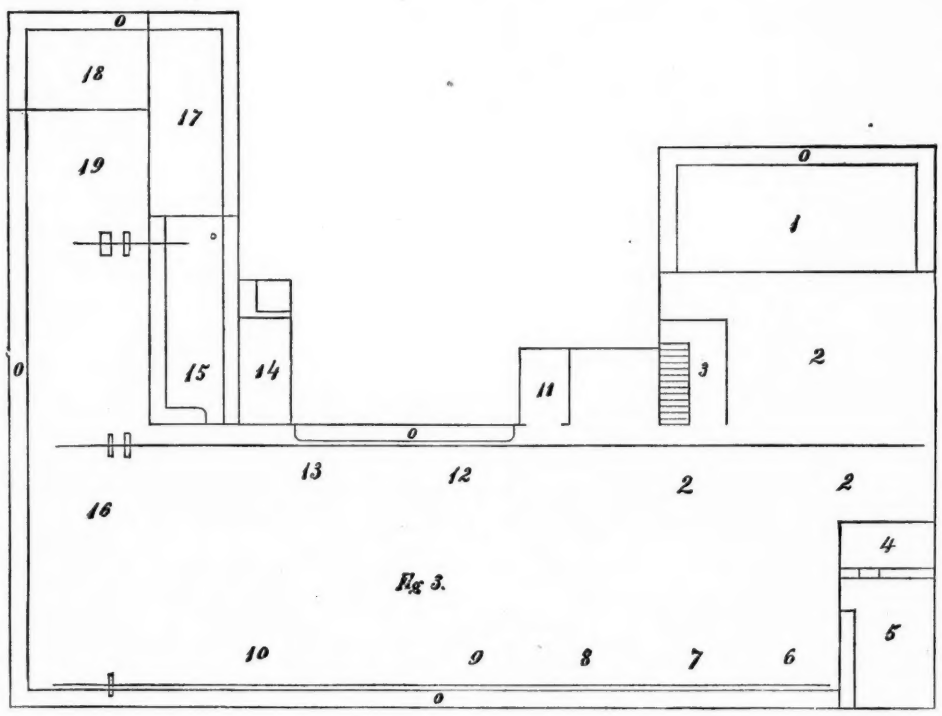


Fig 3.

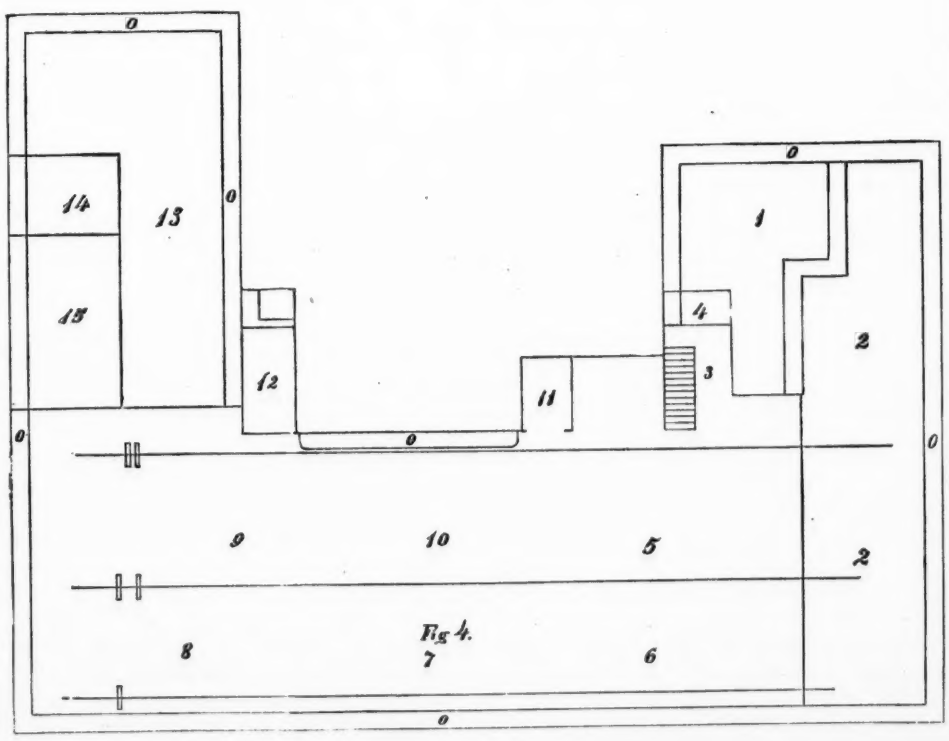


Fig 4.

Advantages of High Speed Engines.

No. V.

BY CHAS. T. PORTER.

It is better to deal with matter than with men. It is neither capricious nor blundering. It will never play you false. You may rest in entire certainty as to what it will do under given conditions. You have entered the region of eternal truth. All seeming contradiction, all that is unexpected and disappointing, is merely the consequence of our ignorance ; and how often, when this is removed, even in a small degree, does that become simple and obvious which has filled us with perplexity.

The inertia of the reciprocating parts of the steam engine affords an illustration of this truth.

The action of gravity is obvious. It is seen and measured in the weight of every body, and to those who have not thought very deeply, it is clear that we know all about it. But inertia does not appeal so directly to the senses, and to most engineers even, the amount of force required to overcome it in a steam engine moving at rapid speed will appear incredible.

In the investigation of this subject it was first necessary to learn the ratio in which the motion of the reciprocating parts is alternately imparted and arrested; and the remarkable fact was ascertained, and has now taken its place among the established truths of mechanical science, that the acceleration of their motion is greatest on the dead center itself, and continues in a uniformly diminishing ratio to the middle of the stroke, where it passes insensibly into retardation, which then proceeds in an augmenting ratio until, at the very termination of the stroke, it becomes equal to the acceleration at the beginning. Four lines exhibit the whole action. If $a\ b$ is the stroke of a piston, and $a\ c$ is the accelerating force at the commencement of the stroke, then the triangle $a\ c\ e$ represents the acceleration at every point in the first half of the stroke, and the similar and equal triangle $b\ d\ e$ represents the retardation at every point in the latter half of the stroke.

But this knowledge would be of little use without some means of measuring the amount of this force. This, however, was very readily found. It is obvious that the force $a\ c$ is double that force which, if uniformly exerted through the distance $a\ e$, would give to these parts the velocity that they have at the point e. A very simple demonstration showed that this force $a\ e$, which has come to be termed the initial acceleration of the piston, is identical with centrifugal force,—is equal to, and identical in its character with, the centrifugal force of a body equal in weight to the collective mass of the reciprocating parts and revolving in the circle described by the crank.

This having been determined, a brief computation gives its amount in any case, as follows :

The coefficient of centrifugal force is the centrifugal force of 1 lb. making 1 revolution per minute, in a circle of 1 foot radius, and is .000341 of a pound. This force varies, first, as the length of the stroke ; for suppose the distance $a\ e$ to be doubled, the revolutions remaining the same, then at the point e the piston has attained a double velocity, but has moved through twice the distance in attaining it, and twice the force acting through twice the distance imparts twice the velocity ; and in like manner this force varies with all changes in the length of the stroke.

It varies, second, as the square of the number of revolutions ; for suppose the speed to be doubled, the length of stroke remaining the same, then at the point e the piston has a double velocity, as before, but now it has attained it in moving through the same distance, and four times the force is required, acting through the same distance, to impart twice the velocity ; and in like manner the force varies with all changes in the rate of revolution.

If now we let R=the number of revolutions per minute, l=the length of the crank, and n=the constant .000341, then will $R^2\ l\ n$=the initial accelerating force of the reciprocating parts of any engine, in terms of their weight.

It's a grate art to build a fire under the boilers.—*N. Y. News.*

And when the boiler bursts the grate artist begins to rise.—*Com. Bulletin.*

And becomes highly e-steamed.

Moulding Raised Pulleys.

BY V. HOOK.

Among the most convenient patterns in a jobbing foundry are "raised pulleys." With a full set of them, the foundry man may fill any order that comes in, both as to diameter and face. A full set of such pulleys should run from eight inches in diameter up to forty-eight inches, varying an inch between, while the faces for the smallest may be one inch, and, for the largest, six inches.

Suppose it is required to cast a certain size of pulley, with six-inch face, the rim of the pattern being but four. On the follow-board, *c*, Fig. 1, lay four or five wooden blocks, *a,a*, two inches thick. On these lay the rim of the pattern, *b,b*, as shown. The drag, *e, e*, is then placed and rammed up. The bottom board, *d*, is then laid on the drag, as shown, and the whole "rolled over," as shown in Fig. 2, the bottom board, *d*, then being at the bottom, as shown. The sand above the rim is then cleared away, together with the blocks, and the "draw irons" screwed into the top of the rim, and the whole "raised" two inches, coming just flush with the top edge of the drag. The sand inside of the rim is dug out till the arms, *g g g*, hub and rim of arms, Fig. 3, can be bedded into place, as shown. The raising of the pulley leaves the two-inch space *f, f*, as shown. A parting is made at *n,n*, and at the center of the arms and "lifters," *m,m*, which are of cast-iron and fit each set of patterns.

The cope, *j, j*, is then placed, as is the gate *h* and lifter irons, *i,i*, by being screwed into the lifters, *m,m*. The cope is then rammed up and lifted off, the pulley rim "drawn," the cope replaced, and the lifter irons, which had been unscrewed previous to lifting off the cope, again screwed in place. A rod of iron, *l*, is slipped through the eyes of the lifter irons and wedged in place on top of the cope by wedges K,K. The cope, with lifters attached, is again lifted off, bringing with it now the lifters and the mass of sand above them and inside of rim, this sand being indicated by A,A,A. This leaves the arms free to be drawn, when the mould is finished, core set, "closed," "clamped," and is ready to be poured. Gear patterns can also be increased in face similarly. In Fig. 4 a solid gear is to be raised the thickness of the blocks, P,P, *o* being the gear; flask, bottom and follow board being indicated by same letters as in previous figures. Fig. 4 being rolled over and follow board removed, it appears as in Fig. 5, with the exception that the gear has been "drawn," the blocks placed *in* the mould, and the pattern replaced on them, when the mould is built up flush with top of flask, as shown. The remaining part of the work is as usual. If the gear has arms, the first part of the operation is the same as above, but, after being "rolled over," the blocks are dispensed with, the patern being raised about a quarter of an inch at a time, and kept in position by being "tucked" under the arms. The pattern is alternately "raised" and "tucked" till the mould has the required face.

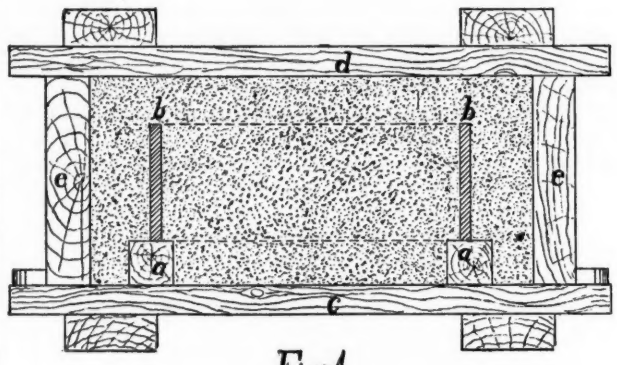


Fig. 1.

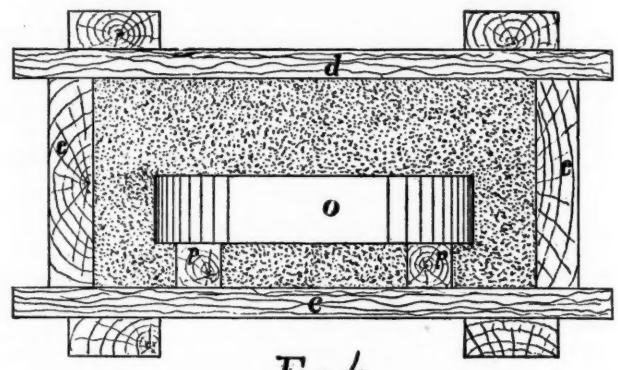


Fig. 4.

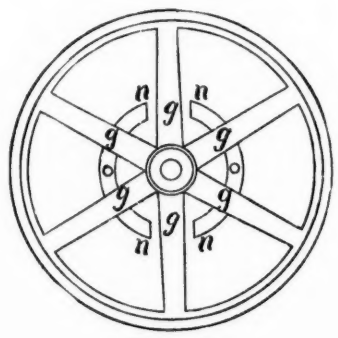


Fig. 3.

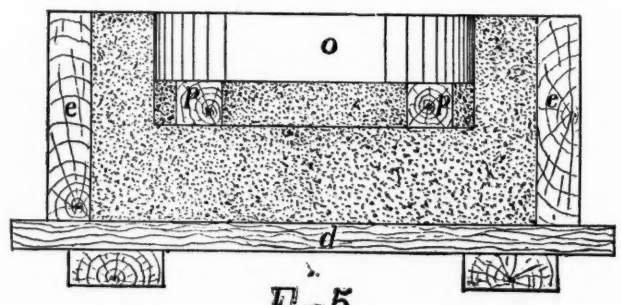


Fig. 5.

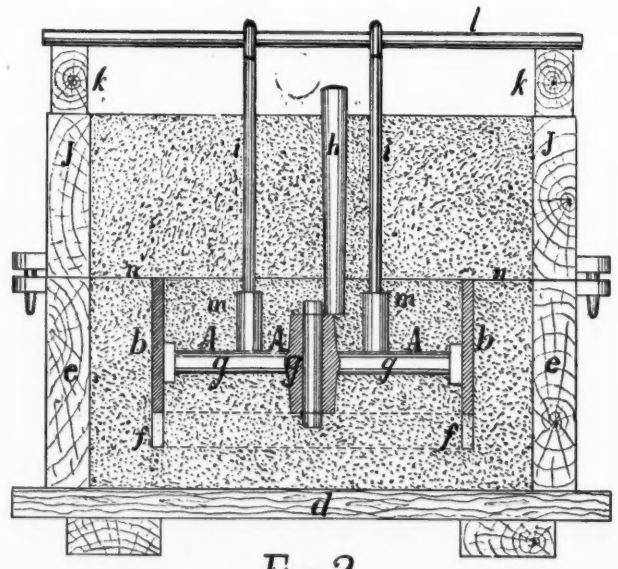


Fig. 2.

As showing how much machinery sometimes cheapens production, it is said that Mr. Perry, who made the first steel pen on a commercial scale, paid his first employee five shillings for making each pen; and even when the trade had become regular he gave for some years as much as thirty-six shillings a gross to his workmen Now, thanks to machinery and modern improvements, pens can be made and sold at a profit for three cents per gross!

Wages in the Lake Shore Railroad shops, Cleveland, O., have been advanced for skilled laborers about one dollar a week, and for common laborers about sixty cents a week. The wages in all the blast furnaces throughout the State have risen about ten per cent.

It is estimated that in the numerous manufacturing establishments of Taunton, Mass., nearly a thousand more men are employed than one year ago.

The Champion Moulder.

The New Haven *Register* prints the following story, which does not seem entirely probable, but may be true in some particulars:—The hardest working man in the State lives in Norwalk. By birth he is a Swede, and by occupation an iron moulder. He is occupied in a Norwalk foundry, and every day does what is considered a fair day's work for two men. Beginning at four o'clock in the morning, he keeps busy until seven at night, not even stopping for his meals. When he goes to his work in the morning he carries with him a pail containing soup and black bread. This pail he places on a shelf over his bench, and, when hungry, he grasps the pail in his teeth, and throwing his head back drinks the soup While he is drinking, his fingers are busy packing the sand into the mould, and when he stops for a bite of black bread it is but for an instant. His day's work is always 200 moulds, while 120 moulds is considered a good day's work for a first-class workman. This man seems to have no interest in anything but his work; makes no unnecessary acquaintances, and discourages all his companions who show a willingness to associate with him.

Astronomers tell us that it would take 1,250,000 years, provided there was a telegraph wire from the earth to the nebulæ in Andromeda, for a despatch to reach us there. So no wire will be put up; it would take too long to get the news.

Bits of Experience.

BY PROF. JOHN E. SWEET.

I notice in my article about the buzz-saw guard I failed to give H. L. Salisbury, one of the Cornell students, credit for a suggestion that I adopted in the device. Perhaps I am led to this correction because of Mr. Hoffman's awarding me credit for giving every man justice. I think we all find it a little easier to do the right thing when we get credit for it than when we don't. This inventing something and giving others credit for their help in the matter is a pretty hard thing to do. Working weeks or months, or years even, at a thing always ending in almost a success, and then to be helped out by the suggestion of some workman is a favor not as likely to excite a spirit of thankfulness as to make us mad—mad at ourselves for not having hit upon the same idea. When the thing possesses a considerable moneyed value, it is a pretty difficult matter to decide what is the right and the best thing to do. Illustration: Switch Cam had worked some years at building and perfecting a self-raking reaping machine, and so tantalizingly near perfect had he got it that it would go about 999 times to perfection, and do its work better than any human hand could possibly do, then, on the thousandth trip, it would catch and smash the thing up completely. This belongs to that class of trouble that has bothered many a man besides Cam, and out of which they have been helped in a similar manner. As I remember, Cam had working for him Cute Dodge, who acted as a sort of foreman while working for journeyman's wages, who, seeming to fully comprehend the situation, suggested that by reversing the action of a spring the thing could be made to work all right. Cam did not think so (we never do think so); still he allowed it, or Dodge went, on his own hook, and made a single casting, which looked more like a pine root than a piece of machinery, threw out a half dozen pieces and put his pine root in their places, reversed the spring, and the machine went to perfection. Happening to pay a visit to the place at that time, Dodge consulted me as to the advisability of taking out a patent While there was in my mind no doubt as to his moral or legal right to the invention, my advice or opinion was, that he would do better to let Cam have it, and trust to his generosity and a good position for his pay. He seemed to think he knew more about Cam's generosity than I, and, after a time, he applied for a patent. Cam, learning the fact, applied for a patent also, on precisely the same thing, of course making oath that he had invented it. The result was, an interference case at the Patent Office, which Dodge, after expending all the money he could command and changing lawyers as often as he found they could be bought off, won. And what had he won? A victory for the right; that was something. He had also won a patent on a device of no earthly value, except to Cam and his licensees. What had he lost? A good many hundred dollars and a very good situation. What had Cam won? A hint that enabled him to invent another device that answered his purpose; and, though it cost four times as much, he was not going to use Dodge's device if he could help it. He had won the name of perjuror with a few people at the Patent Office and many outside. What did he lose? A good many hundreds, if not thousands, of dollars in money, a valuable improvement to his machine, and he lost a valuable man.

Now, the question comes: What was the right and best thing for both parties? Just exactly what Sprigley, who was one of Cam's licensees, said at the time: "It was Dodge's invention. It was valuable, and Cam ought to pay him for it." My idea was, and is yet, that Cam could have well afforded to give Dodge $100, or a machine, and that Dodge had much better have taken it, with thanks, for, with all he has been able to do with the invention since, he has only got about even.

Sprigley, the same as mentioned above, has been, for the last four or five years, trying to perfect another machine of the same

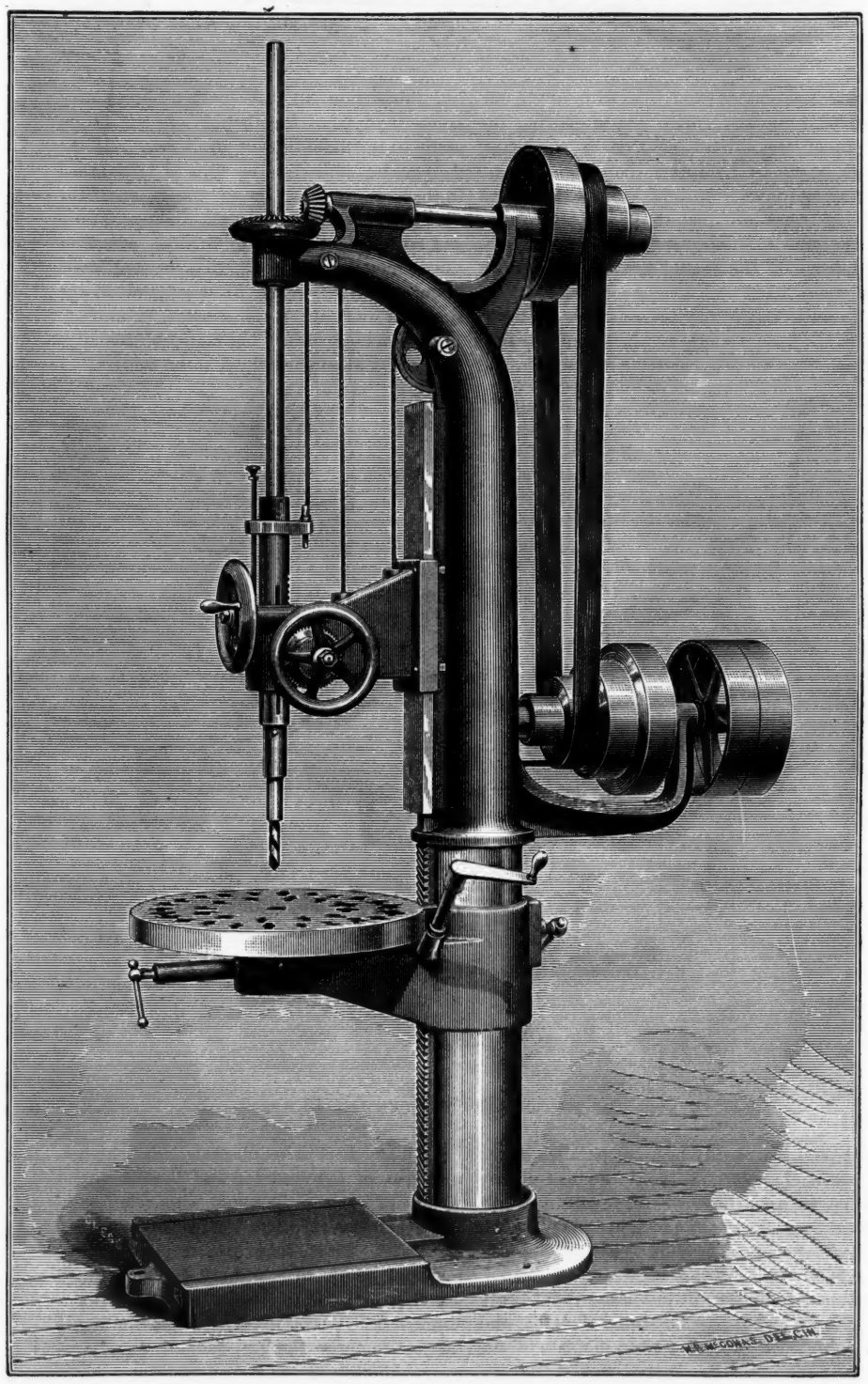
class, and this summer got in about the same fix that Cam found himself in ten years before. He said "if he couldn't make a certain thing work, that he would throw the whole darned thing up." It did not work, but Richards, who is working for him very much as Dodge was for Cam, helped him out in a similar manner. Has Sprigley done Richards justice? Yes—just that justice that Cam did Dodge, and if it does not end similarly it will be because Richards takes the advice that Dodge would not.

The story is told that a workman at the Rogers Locomotive Works once suggested an improvement, and the proprietor took out a ten dollar bill and gave it to him on the spot. I know nothing as to the truth of the story, but I never hear it or think of it without a feeling that it was doing the right thing at the right time.

Another way inventors have of treating outside assistance, which may be open to questionable admiration, is to ignore the value of a suggestion and wait until we think the man has forgotten it, and then bring out the thing as an original idea. The trouble is, they are not forgotten half soon enough. In fact, I know there are lots of things I ought to have forgotten long ago, but I don't forget them.

A New Upright Drill.

The Niles Tools Works of Hamilton, Ohio, have lately put into the market a new upright drill, which we illustrate on account of several details which are new. The illustration represents a machine drilling to the center of a twenty-four inches, and called a twenty-four-inch drill. The larger sizes have back gearing and self-feed. The peculiarities of this tool lie in the method of raising and lowering the table; in the plan of balancing the spindle, etc.; in the device for gauging the depth of the drilling, and the belt shifter. The table is raised and lowered by means of a worm working into an angular rack. This allows a workman to adjust the table nicely, and without leaving his usual position. The table and arm clamps are furnished with levers, which obviate the necessity of looking up wrenches. The spindle is balanced as usual by a weight inside the column, but by the novel arrangement of sheaves, shown, the same weight is caused to balance the lower stock as well as the spindle. The depthing gauge is simply a nicely graduated rod, sliding with a spring, fitted into the lower stock, and freely through a lug upon the feed sleeve. If, when the parts are in the position shown in the cut, the workman pushes the gauge rod down as far as it will go, the zero on the rod will be even with the under surface of the sleeve lug. As the sleeve feeds down the rod stands still, and the depth of drilling is shown by the graduation coinciding with the under side of the lug. A blind piece, similar to a gun sight, is fixed under the lug so that the graduation can be read accurately. When the lips of the drill reach the surface of the work, the workman pushes the gauge rod down, and then feeds the drill till the proper depth is shown on the rod. By an oversight the belt shifter is shown on the "other" side of the machine, or, in other words, hardly shown at all. Its peculiarity is that the arm, through which the shifting rod slides, revolves upon the same axis as the shaft, and the shifter can thus be brought to suit the belt, no matter what direction it comes from. This will be appreciated by those who have had to devise a special shifter to suit some special angle of belt. The gears on these drills are all cut, and the spindle has a quick hand motion in addition to the regular feed motion. The power of the feed has been nicely fixed at that point where the necessary force is given to large drills, and at the same time the proper sensitiveness retained for light drilling.



New Upright Drill.

Single and Double Horizontal Engines, and the Transmission of Power to Main Lines and Counter.

Editor American Machinist:

A wide diversity of opinion among experts and builders on the subject indicated above leads one to approach it with caution.

One of the constructing engineers in this country (Mr. Chas. T. Porter) would probably, should parties apply to him for a 1,000 H. P. engine, recommend, if high pressure was desired (without condensing), a single cylinder, 36in. diameter, and say, 48in stroke, and about 110 revolutions of crank shaft per minute. If condensing, the cylinder would, I suppose, be from 30in. to 32in. diameter. He would in both cases cut-off at one-fourth the stroke. The driving pulleys would be 15 feet diameter, according to Mr. Porter's standard, though this proportion would not give as good results as smaller pulleys and wider belts, making belts double instead of treble. Thick belts do not have long life, according to my experience.

We will now draw comparisons between the single and double cylinder plan, not considering, in this writing, the compound engine system.

To develop an honest 1,000 H. P. with the two cylinder plan (cranks at right angles) we would require each cylinder to be 26 in. diameter, with a stroke of 40in. and 135 revolutions of crank shaft per minute (non-condensing). Beginning at the cylinder, we all know that the loss of heat in the one cylinder plan would be much less than the double plan; likewise the friction, wear and tear, and valve leakage; while 110 revolutions per minute gives a motion steady enough for all purposes.

Looking then, at the advantages attendant upon the use of the single cylinder, one can hardly see the use of at least 50 per cent. additional expense in selecting a double engine. There are, however, some details of engines and methods of operating connected with the double plan that are considered by some engineers to be superior to the single design. I suppose their reasons can be explained in a few words. In the first place, the crank shaft for the 36in. × 48in. single engine must be not less than 16in. diameter, and about 21 feet long (without a middle bearing); the driving drums occupying 10 feet of the length—the weight of this shaft would of course be enormous—while the matter of lubrication of the large bearings would be an item requiring the closest attention. Now with the double-cylinder two crank plan, the main shaft to transmit 1,000 H. P., if made 12½in. diameter (135 revolutions) would be ample, and would only weigh a little more than half as much as the 16in. shaft, and lubrication would be comparatively easy, while the driving pulleys need to be but 9 feet diameter. Some engineers claim that it is always best to divide up the power of large engines, say above 250 H. P., (in pairs) in order to run only a portion of the work when desired; but with the exception of some special cases, I do not believe in arranging power with a view of adopting the system just mentioned. And now as we have considered both plans to a somewhat limited extent, I will only say that the few advantages claimed for the double cylinder plan, are more than outweighed by the real substantial ones of the single engine system, with a center bearing on main shaft; while, with our improved and perfect method of lubrication, all fears of serious trouble from heating and cutting may be dismissed.

Before closing I will refer to a few methods of transmitting power from engine to line shaft or shafts. The practice of gearing an engine to and speeding up a Jack shaft, should be avoided in all cases; likewise narrow thick belts; likewise belts running more than 4,500 feet per minute, as 3,800 feet will give the best results in the long run. Not long ago I saw a 550 H. P. engine attached to a single line shaft (full load on and a little more)—if I remember rightly, there was "music in the air," which was continued until the power was led to two line shafts.

Further, 1,000 H. P. should be transmitted to work, through at least three line shafts on counters, and four would be better. If three are used, the driving belts should each be double and 40in. wide (speed 3,800 feet per minute is the best for economy,) the counter and line shafts at the point of receiving power supported in self oiling bearings on a firm truss gallows frame constructed of channel and beam iron; bearings universal, and three and one half times the diameter in length. The counter or line shaft pulleys should be split and keyed to shaft, the keys one and one half times their depth in width. A pulley 40in. wide should not be crowned more than ¼ of an inch; if belts will not run with that allowance something is wrong with the setting up. And I would suggest the making of driving and counter or line shaft pulleys, with the rims mortised to receive well seasoned white pine segments, to be turned off true and smooth and bolted after being driven into the rim. This method would add 25 per cent. to driving power or traction of pulley, while the rims would be much lighter, an important item as to line shaft at all events. In conclusion, I will add that the use of two or more driving belts to take the power from large engines, is an absolute safeguard against accident, as all of the belts would not break at once.

Wm. H. Hoffman,
Passaic, N. J.

The largest stamp mill in the West has just been completed and put in operation at the Homestake Company's mines, at Deadwood, D. T. The machinery consists of a three hundred horse-power Corliss engine, with two pairs of boilers, four Blake rock breakers, 120 stamps, 24 Hendy's self-feeders and 24 Hendy concentrators. The engine cylinder is 26x48. The weight, 90,000 pounds. There are two fly wheels, each eighteen feet in diameter, which are the driving pulleys of the two line shafts. The engine was set up by a Mr. Allen, sent out from Rhode Island for that purpose, and works perfectly. Only one pair of boilers are required and sixty pounds of steam, cutting off at one-fifth, runs the entire machinery.

The Cleveland, Painesville & Ashtabula Railway Company has just placed on its line the first of the new locomotives constructed for the road by the famous Baldwin Locomotive Works, of Philadelphia, named the Collamer. It is a beautiful locomotive, and the village of Collamer may well be proud of her. All the new locomotives are constructed for hard coal, so that there will be no smoke of consequence. The Collamer has ten-inch cylinders, a sixteen-inch stroke, forty-three-inch steel wheels, straight steel boiler, and Eams' latest improved vacuum brakes on the driving wheels and tenders—in fact, every thing as good as it can be made. The weight is fourteen and one-third tons, and it can easily make forty miles per hour with five loaded passenger cars.

The locomotive works at Paterson, N. J., are building engines for Brazil and Costa Rica, and one for Cuba is awaiting shipment. The Passaic rolling mills are making parts of seven bridges for the Costa Rica railway.

Buffalo Cylinder Oil Pumps.

In the AMERICAN MACHINIST for Sept. 13th, "Chordal" gave some interesting points about cylinder lubricators, in which he took occasion to observe that Buffalo-built engines always have oil pumps, and oil pumps most always come from Buffalo. He pursued the subject in the following strain:

"That city recently had an attack of the automatics, and the consequence is, they have put a ratchet crank motion on their pumps, and work it from any part of the engine.

"The first that I saw were invented by the Chief Engineer of the Lake Superior Transit Company, and were being used on that company's vessels. The reservoirs were large, and the amount of feed nicely adjustable. Last week a Boston gentleman showed me a somewhat similar one, gotten up in Buffalo, in good commercial style. It looked much less expensive than any of the other automatic lubricators I have ever seen. I was informed that it would soon be in the market, and whether it is or not, I begin to feel convinced that Buffalo is in the right path, and that the engine lubricator of the future will be a pump driven by the engine. One good thing about them is, that an ordinary engineer can understand them without going into the study of the natural sciences."

We illustrate, on this page, the automatic oil pump mentioned by Chordal, to which our attention was also directed some weeks ago, in Boston. It is the invention of E. G. Felthousen, 61 Main St., Buffalo, N. Y., by whom it is manufactured.

It is hardly necessary to inform engineers that a pump is the most positive acting cylinder lubricator that has ever been devised. In making it simple and automatic, the best results should be secured. This has but one check valve, and, owing to the peculiar construction of the pump, it does not wholly depend upon a vacuum. The suction hole, 5, is directly in the center of the pump, and, as the plunger passes on its backward stroke, the oil flows into the barrel, either by its own gravity, or by the vacuum caused by the movement of the plunger. The further the plunger passes the suction hole on its forward movement, the more oil goes into the cylinder. The adjustment of the plunger is effected by the set screw, 4. The propelling movement is the reversible pawl or dog, 2. As will be noticed, the feed can be regulated by raising or lowering the rod 1, so the pump plunger will be carried forward one or more notches, as desired, at each revolution of the engine. When the plunger is drawn out its full length, the pawl reverses itself and feeds back again. This automatic lubricator is very highly spoken of by engineers who have given it a trial. We understand it is offered at a very reasonable price.

Durable Boiler-Tube Cleaners.

The lazy and careless engineer lets the tubes of his boiler clog up with soot while he plays euchre in the most convenient lager beer saloon, or talks over the political situation with gentlemen of leisure. The foul tubes necessitate the burning of a large quantity of coal that might be saved, and a hole is gradually made in his employer's pocket. The careful and attentive engineer remains at his post and keeps his boiler-tubes clean by using a scraper like the one herewith illustrated, which is known as the "Excelsior," and is manufactured by Ruffner & Dunn, Schuylkill Falls, Philadelphia, Pa. Its construction can be seen at a glance. The object of the springs is to expand the tool so as to keep its edge close to the inside surface of the tubes. It is made wholly of steel, and is very durable. It is constructed in two sections, one overlapping the other, thus preventing the loosened scale from passing back of the cleaner, and while the spring keeps the sections in their places, it will yield to let them pass over any imperfections, or blisters, there may be in the tubes.

They are adapted to cleaning either vertical, or horizontal boilers, and are not sold at any high price.

An electric light in Saratoga enabled persons to read a newspaper at Ballston, 7½ miles distant, on a dark night. A powerful reflector was used.

Extracts from Advance Sheets of a New Book on Mechanical Manipulation.

No. 2.

BY JOSHUA ROSE, M. E.

* * * The advantages of the Whitworth, or round top and bottom thread are—that the master hobs and taps, used as cutting tools to produce the working, screw-cutting dies, taps, etc., are sure to have their angles and the depth of the thread correct when the thread is cut to its full depth—that is when a full

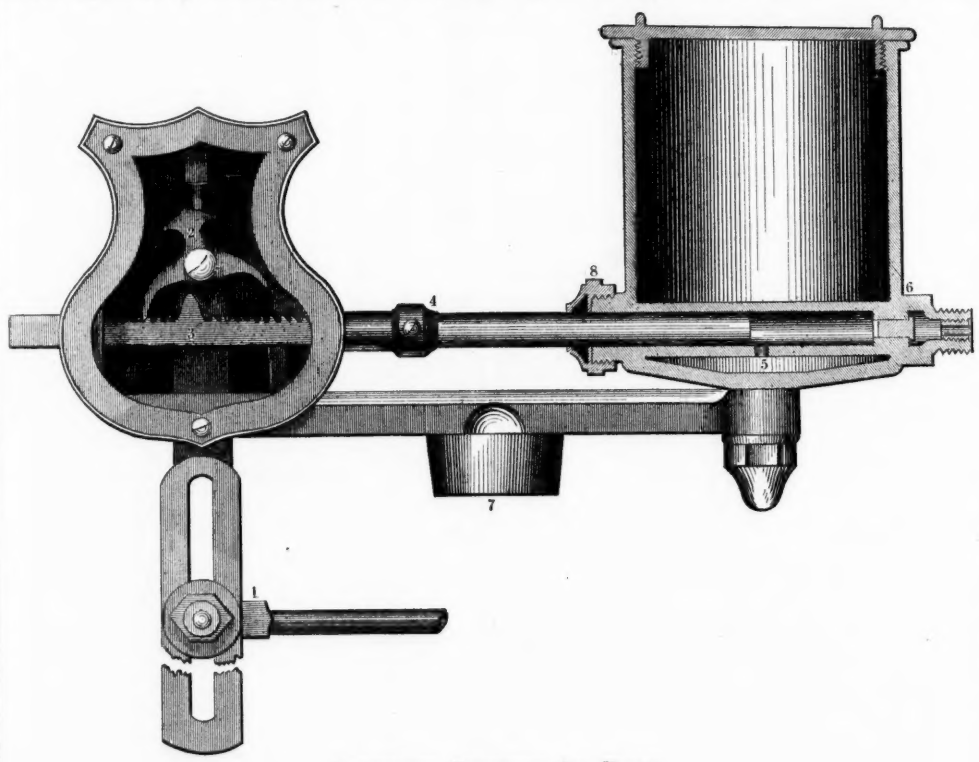
thread is produced; and this without the employment of any gauge for measuring the depth of the thread, so that if the blank work be cut to the gauge diameter, and the chaser be entered until the tops of the thread on the work are just rounded, no further measurement is necessary since the angles and depth of the thread are determined by the chaser itself.

Again a chaser may be set more easily to the work than a single toothed tool, because its belt tops may, by shifting the tool in the latter rest, be readily brought parallel to the blank of the work, without the use of any gauge to set it by, whereas with a single toothed tool such a gauge is necessary.

* * * The advantages of the sharp V thread are that, it can be easily originated, and that the screw cutting lathe tool is easy to grind, since it has no rounded or flat end or point. On the other hand it weakens the bolt by reason of the sharp wick at the bottom of the thread. Furthermore, as the cutting edge of the threading tool becomes dulled (and this occurs to some degree from the first instant the tool is put to use) its action partakes of the nature of forcing, as well as that of simply cutting, the metal and this (especially in the case of cutting long threads in the lathe) induces the tops of the threads to rise slightly above the diameter of the work, producing a protruding feather edge, and rendering it necessary to remove this edge with a smooth file. Now suppose the blank work to be made to correct gauge diameter, cutting the thread upon it, raises this fine edge above the standard diameter, and in removing this edge the gauge must again be employed, or too much metal may be removed and the thread tops reduced below the proper diameter. In this case there is no accurate method of gauging the depth of the thread, unless by measuring the diameter at the bottom of the thread.

This, however, possesses several disadvantages. First, the calipers, applied at the bottom of the thread, do not stand at a right angle to the axis of the bolt on which the thread is cut, hence as the same pitch of thread is necessarily used in mechanical manipulation on work (except in the case of standard bolts and nuts) of widely varying diameters, and as the angle of the calipers, upon the same pitch of thread, would vary (decreasing as the diameter of the thread increases) the diameter, measured at the bottom of the thread, would bear a constantly varying proportion to the diameter measured across the tops of the thread, and at a right angle to the axial line of the work. If the calipers be applied to the tops of the thread in the same manner (at an angle) as to the bottom, the relation between diameter at top and bottom of thread will be alike, whatever the diameter of the work may be, but these diameters will bear no fixed relation to the standard diameter of the work.

It is, then, obviously impracticable to gauge threads by measuring them at the root.



AUTOMATIC CYLINDER OIL PUMP.

* * * It is to be observed that the bottom root of a round top and bottom thread will be of correct diameter with relation to the top, whenever there is a full thread.

* * * Thus, then, the threading of a piece of work to standard diameter (in a lathe) with a sharp corner thread, using a single toothed tool involves the grinding of the tool to correct angle—turning the diameter of the top of the thread to correct gauge diameter, the employment of a gauge to set the tool by, and the employment of a gauge to test the depth of the thread, while in a round top and bottom thread, setting the tool, and turning the blank to gauge diameter is all that is necessary.

* * * If a chaser is employed to cut a sharp V or U. S. Standard thread all these advantages may be obtained, but in that case the advantage of ease of origination will be lost, as the tool cannot be accurately obtained by grinding, and furthermore, if cut soft it will contain the error due to hardening.

* * * There is one important advantage possessed by the single toothed, screw cutting tool for lathe work, in that it can be more easily adjusted for height with relation to the work than a chaser can, because the single toothed tool can be ground on the end, the top of the tool being made horizontally level with the center of the work. But a solid chasing tool must be ground on the top, which necessitates lifting the tool and adjusting it for height as the grinding proceeds. The Pratt & Whitney Co. obviate this difficulty by employing a chaser held in a tool holder, lifting the chaser in the holder as the wear proceeds.

* * * To facilitate setting a screw cutting tool the height of the tool steel should be made the same as the vertical height between the top of the slide rest and the center of the lathe centers, so that the top of the tool will be truly horizontal and even with the center of the work when simply laid on the slide rest, and it is obvious that the tool should not be adjusted for height by being thrown out of the horizontal level, otherwise the depth and angle of the thread cut will not be the same as that of the tool.

Do not spend your precious time in wishing, and watching, and waiting for something to turn up. If you do, you may wish, and watch, and wait forever. Things don't turn up of themselves; you must turn them up. You can do it if you will, but you must put forth the effort. Idleness and indifference never accomplished anything. It takes energy and push to make headway in the world. And an active, energetic, persevering man is sure to succeed. If he cannot do one thing, he will do something else. If he cannot succeed in one direction, he will in some other. He will do something. He will not waste his time in idleness. There is no lack of work, no lack of opportunities. Do what comes to your hand, and do it well. True progress is from the less to the greater. You must begin low if you would build high. Work is ordinarily the measure of success. Quit resolving and re-resolving, and go and do something.

Mr. Samuel W. Powell, of Philadelphia, has been appointed professor of practical mechanics and director of the machine shop at Cornell University in place of Professor John E. Sweet, resigned. Mr. Powell is said to be a thorough machinist, having served seven years in one of the largest establishments in Philadelphia. He afterward was graduated from Lafayette College, at Easton, Pa.

A committee of nailers from the Fall River Iron Works waited on the treasurer, Sept. 22d, and asked for an increase of wages. They were promptly told that after Oct. 1 wages would be increased 10 per cent.

Extracts from Chordal's Letters.

Mr. Editor:

* * * * In a letter some weeks ago, I expressed the opinion that the indicator possessed a useful function, even in the hands of an engine-tender who could not analyze a diagram. I also stated that I believed my views on this subject to be unorthodox and against the opinions of experts. Since that letter was written, I have had speech with several of our most prominent "indicating engineers," and, much to my surprise, they all think the same as I do on the subject. Their experiences were about the same. They were sent for by an engine owner, too much coal being used. Engine tender didn't know how to remedy things—wanted expert opinion. Experts put indicators on—got a ton of data; *set the valves*—got another ton of data; goes home and figures up a long scientific report; delivers report and bill for a hundred dollars; owner throws the useless report away and pays the bill willingly, knowing that, aside from the report, the experts have done something to

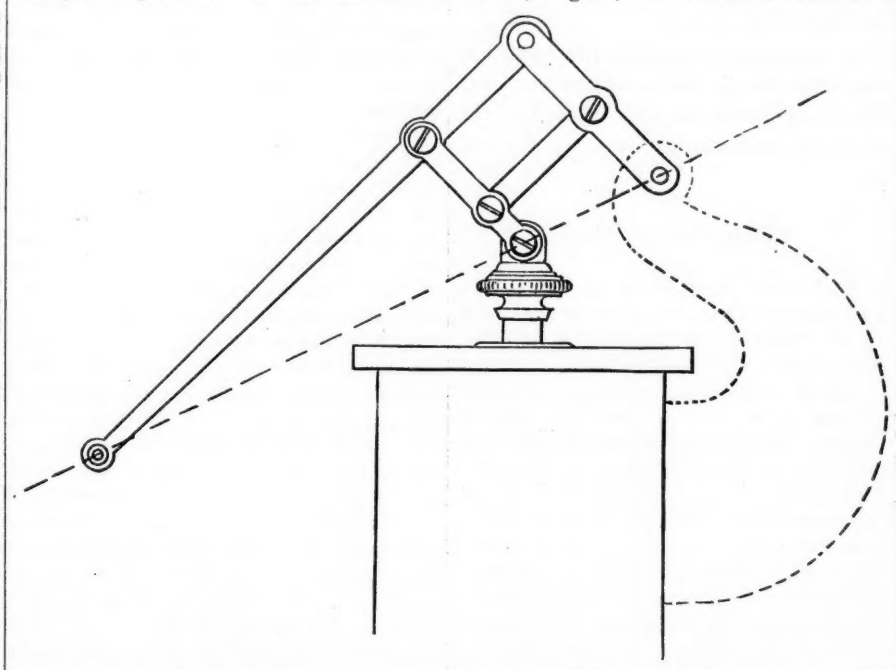
his engine which will save him a hundred dollars a month, maybe.

The expert gets his money, and has the gratifying consciousness that he has given more than value received. In a year the same thing happens—same tests, same tons of data, same fixing of valves, same report, same bill, same consciousness aforesaid, except that it is alloyed by the knowledge that the engineer in charge *ought* to have been able to do this second job, and was able, if he had the proper appliances. The expert's first cards showed a bad condition of the valve motion. The valves were readjusted on judgment, new cards taken and calculated, &c., until it was decided the engine was doing its best. There is where the engine ought to stay, and a fine sample card is produced as a model. The expert, in getting cards which he could calculate, required an indicator having a known area of piston, a known resistance in the spring, a known uniformity in the spring, a known correctness of transmitting motion to the pencil, ditto to the paper; he must have a scale of known conformity with the spring, and general conditions known to be what they appear to be.

Now, suppose that after he has the engine in good shape, and produces, with such an indicator, a proof card, he takes his indicators off and puts on a ten-dollar indicator, whose piston area is not known; whose spring resistance is not known; whose spring is known *not* to be uniform; whose pencil motion is known to be a *constant distortion* of the indicator piston motion; whose paper motion is known to be a *constant distortion* of the engine piston motion. Such an indicator will produce a card, if it can be called a card. No scale will measure the card; no formula will determine any of its virtues; no judgment will be able to analyze it, but positive knowledge assures us that it is a card from an engine in good condition. A little research will enable one to find the points of admission, closure, and release upon this card, and why is it not wise to leave this indicator on the engine; instruct the engineer in its use; paste the nondescript model card upon the wall; post the engineer as to the requirements in case of variations; and tell him to make that engine produce *fac-similes* of that model card every day, and month, and year, and thus make the expert's services of permanent value? Can't some of your readers scheme out such an instrument, and, in view of the "costive" essentialities being omitted, can't the price be brought down to ten dollars? Every builder of high class engines wants his engines to perform well, even after he has got his good money for them, and he would willingly put upon each one any contrivance which would tend to retain the virtues of correct adjustment, which he originally obtains by perfect indicators in the hands of skilled experts. Call the instrument a vaporgraph and the diagram a valve card, so the thing won't get mixed up with a *bona fide* indicator.

* * * * Speaking of indicators, I had a talk with Mr. Richards a few weeks ago. He is the parent of parallel motion indicators, and is one of those quiet, diffident gentlemen whose life and experience is full of things of general interest to the craft. Every engineer who pushes an indicator pencil to the paper shakes hands, in a way, with Charles Richards, and they deprive themselves of a pleasure if they let slip a chance to meet him in the flesh. Mr. Richards is one of those rare men who is liberal enough to appreciate what his followers have done. Instead of assuming that his work was completed when he left it, he enters keenly into the spirit of the innovations of Thompson and Sweet. He showed me a new kink in indicator motions. A real parallel motion, and not a geometrical approximation. A sketch is given above. It will be at once recognized as a pantagraph, in which the true piston motion is simply multiplied and transmitted to the pencil. In construction the linkage system is of any proportion so long as it is a parallelogram. The multiplication is as usual, the essential point being that the stationary pivot, the piston pivot and the pencil be in a line, as shown by the dotted line. Mr. R. made a single one of these instruments, which Mr. Pickering took over to the late Paris Exposition. It received a silver medal, and was presented to the Conservatoire des Arts et Metiers:

* * * * Mr. Moore, Superintendent of the American Steam Gauge Co., of Boston, who manufacture all the indicators in this country, showed me somebody's patent indicator, in which the Bourdon spring movement, properly multiplied, &c., was substituted for a piston. If such a thing would work, it would help out the "vaporgraph" problem considerably, but I question whether a Bourdon spring would respond to sudden changes in pressure. It will indicate the



pressure with a permanent accuracy, but will it do so suddenly? Does not a Bourdon spring have to acclimate itself to the heat of the contained steam, and does not the nature of material prohibit sudden acclimation?

* * * * I am still on the search after some perfect time-keeping plan. When I find it, you shall be promptly advised. I find, in many shops, that as much difficulty is experienced in getting the correct time on jobs as to get the workman's whole time. In fact, there is no difficulty in getting the man's total hours, if you will go to the trouble.

Perry wrote me last week about his time operations. He works about five hundred men on a class of work which demands close attention to the cost of details. He uses tickets like this:

Work by... .....
For.....

No. Hours.	DESCRIPTION OF WORK.

When work is done by the hour for any party, write on this card the name of the party and the name of the article.

The work in Perry's shop is done entirely through contractors in the shop and the "For" in the above ticket is for the contractor's name. Mr. Perry writes: "The men are obliged to take their cards from in front of the time-keeper, or, rather, he deals them out to them, so, when they are late, they have to show themselves or go without a card, in which latter case they would have none to present at the end of the day's work, and if they quit before time the time-keeper will know it, because the cards must be deposited with him in person. The cards are each day stamped with the date. So far, so good, but what shall we invent to compel men to set down their time properly and honestly. Some are heedless, some are dishonest, so Jones has to pay for work which Smith should pay for, or Jones gets his for nothing, perhaps, and the poor shop has to come in for more than its share. It is true the men are instructed to specify the number of hours spent on each piece, but who is smart enough, even if he had time, to examine every man's day's work, and his time-card, and be able to judge correctly whether he has twenty-five per cent. too much, or too little time, put down to a certain job. We have automatic machines for doing a great many kinds of work, but for Heaven's sake (and for ours) give us an automatic machine for keeping time.

* * * * If Mr. Perry's time-keeping machine could be produced, could it be called a labor-saving machine, and is it right to apply this term to every automatic machine? Is it not true that much, or even most, automatic machinery does work which an unlimited number of men could not do? Perry don't want to save time-keeper's work. He wants time-keeping *done properly*. If this labor is not done now, and the machine would do it, would it not be right to call it a labor *producing* machine?

* * * * What constitutes a labor-saving machine? Won't a man who keeps a cold chisel sharp do about twice the work of a man who works with a blunt one? Is a sharp cold chisel a labor-saving machine? Don't a sharp cold chisel do all the work and let the second man stand idle? Cooper worked for me a while, and he was the most bigoted Englishman, the worse posted man on mechanical subjects, the best posted man on classical literature, and advanced communistic ideas, and the best vise hand withal that I ever saw. He cut up ridiculous didoes at every new machine we got into the shop, and always wanted new files, and worked with the keenest of chisels, and most effective hammer stroke. At one time I did instruct the boys to kill him before he embittered their lives. His classical attainments gave him some dignity, and put a vicious force behind his villainous speeches. Happily his speech was his antidote. He would in one breath anathematize some innocent little shaping maching as taking the bread and butter out of men's mouths, and the next minute he would confidently assert that he could do more and better work than any shaping machine ever built.

* * * * Another time-keeping wrinkle, Mr. Cope, of the Cope & Maxwell M'f'g Co., Hamilton, Ohio, sends me one of their tickets, and, as he has kindly sent me an electrotype of the form, I send the same to you. Mr. Cope writes that in their business, the manufacture of steam pumping machinery, they desire to know just what time is expended upon each kind of work, on every piece, and also the present status of the job.

It will be seen that they use a peculiar symbolism to express these matters. Some features of this form would be understood only in connection with the whole of the time-book form. Mr. Cope kindly writes that I am at liberty to ask any questions, and I may yet do so. I here give the form of time ticket entire.

These tickets are taken up so early in the morning as to detect lateness. I don't see how this ticket will help Mr. Perry's troubles any.

The more questions I ask about time-keeping, the more I find folks want something better than they have. At the same time all seem willing to give any one the benefit of any useful features they may have. All seem very liberal in this respect, except, I might say, some of the Philadelphians, and even these folks may become more free and open when the knowledge dawns on them that people are actually running real machine shops, and doing "some" very good work outside of Philadelphia.

No...... *Hamilton, O.,*.....*187*

	NAME OF JOB.	NAME OF PIECE.	SIZE OF MACHINE.	HOURS WORKED.	KINDS OF WORK.	STAGE OF WORK.

TOTAL HOURS WORKED.

Roughing.
Boring.
Turning.
Chasing.
Drilling.
Planing.
Vise.
Testing.
Begun.
Continued.
Finished.
Begun and Finished.

In my summer pilgrimage, one of my pet Philadelphia heroes quickly dispelled the glamour which I had thrown around him, by his marvelous show of ignorance in this respect. He didn't look down, he was simply blind.

* * * * Very respectfully,

CHORDAL.

Twenty-five hundred men are on strike in the Cumberland region.

When Benjamin Franklin was an editor, he was in the habit of writing to the young ladies who sent in poetry, saying in honeyed language, that, owing to the crowded state of his columns, etc., but he would endeavor to circulate their productions in manuscript. And then he tied the poems to the tail of his kite for "bobs."

AMERICAN MACHINIST

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☞ *We are not engaged in procuring patent rights, or in selling machinery; nor have we any pet scheme to advance, or hobby to ride.*

☞ *We invite correspondence from practical machinists, engineers, inventors, draughtsmen, and all those specially interested in the occupations we represent, on subjects pertaining to machinery.*

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NEW YORK, OCTOBER 11, 1879.

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Special.

We wish to make the following facts fully understood by our readers:

1st. That nobody has ever paid the publishers of the American Machinist one cent for anything inserted in its reading columns, either for illustrated descriptions of machinery and tools, contributed articles, editorials, manufacturing notes, book reviews or reviews of shop supplies.

2d. That we never will publish any notice for pay, either direct or indirect, except in our advertising columns.

3d. That no party interested in making or selling machinery, engines and boilers, or in their manipulation has, or ever has had any pecuniary interest in the American Machinist.

Equalization of Wages.

We have in two or three late issues made some extracts from Secretary Evarts' book on the "State of Labor in Europe," and once took occasion to point out some of his errors in regard to reducing wages of American artisans to the level of the same class in Europe. Referring again to his 39 page letter prefacing the consuls reports, we find some expressions which, emanating from any one of less recognized ability, would be considered very bad logic. He says, "Our inventive genius in mechanical appliances is original, and at least twenty-five years ahead of Europe. Our people accept innovation, are prepared for it by anticipation; Europeans do not. *One workman in the United States*, as will be seen from the foregoing extracts, *does as much work as two workmen in most of the countries of Europe;* even the immigrant from Europe attains this progressive spirit by a few years association with American workmen. * * * * The first great truth to be learned by the manufacturers and workingmen is that the days of sudden fortunes and double wages are gone. We must realize the fact that ocean steam communication has annihilated distance and brought the nations face to face. This drawing together of the nations means *equalization in trade, profits, wages*, etc., the advantage being with those who soonest accept the situation, and show the most sensible continuity in the new paths of success. * * * * In the near future, the workingman of New York cannot expect twice or thrice the wages of his fellow worker in Europe, while all other things—food, rent, clothing, etc.,—are on an equality."

The American workman does twice the work of the European, yet, "in the near future," according to Mr. Evarts, he can not expect twice or thrice the wages. It is a well-recognized principle among manufacturers who employ workmen throughout this country, that a man who habitually does twice the work of another should receive (and is paid) twice the wages of the latter. It is the amount of work done that an employer expects to pay for, rather than the number of hands and heads engaged in doing it. Workmen know and accept this principle, and those most ambitious endeavor to excel in order to obtain higher wages. No "drawing together of the nations" can effect equalization of wages any more than it can bring about an equalization of intelligence. Mr. Evarts (unconsciously we feel assured) gives expression to the most degrading principles of trade unionism, viz.: Equalization in wages of workmen in the same pursuits. The trade unionists extend this principle only through limited districts, but Mr. Evarts would apply it to all Europe and America. As goods are not sold according to the number of day's work expended in producing them, but according to the actual value of the labor and material required to produce them, as measured by the most efficient methods and processes, it is difficult to see what advantage would be gained, either for the employer or for the skillful workmen, by an equalization of wages. The employer is desirous of having his work done as cheaply as possible, consistent with quality. Reduction of wages would give him an advantage, and this is what Mr. Evarts seems to be offering excuses to bring about. Had he waited until this autumn before writing his elaborate letter, summarizing the consular reports, he might have given less confident utterances upon the subject of a sweeping reduction of wages "in the near future."

Just now, competent workmen are getting advances in wages all over this country, and it is a bit of rare news to hear of any general reduction. The advance is paid by employers because of *value received*, and so long as exports of American manufactures increase with the rapidity they now do, there is little danger of any reduction in mechanics' wages on account of foreign cheap labor. We may be met by the declaration, that it is improved labor-saving machinery that enables our workmen to compete so successfully with their rivals in Europe, and that, as soon as this is extensively introduced on the other side of the Atlantic, the high advantages enjoyed by American workmen will be leveled down. It is true that labor-saving devices give our workmen the greatest opportunities, with their productions, to compete in the markets of the world, and as their inventive genius, fostered and encouraged by liberal rewards, is likely to remain "at least twenty-five years ahead of Europe," no fears need be felt about their retaining the supremacy. Mr. Evarts justly remarks that Europeans do not accept innovations. It is very difficult to introduce any labor-saving machine in those countries. Even when such machinery has been entered from the United States unopposed, in most cases the workmen have failed to accomplish, by its aid, the most common results achieved here. Until there comes an equalization of all social and industrial institutions on both sides of the Atlantic, there will be no equalization of wages.

American Institute Fair.

Any thoughtful, observing individual will find much that is interesting and instructive in any of our autumn exhibitions. Even should nine-tenths of the articles displayed be familiar to him, the other tenth may give him ideas of unusual value. It was with this fact in mind that we recently spent an hour or two in the American Institute Fair, now open at Sixty-third street and Third avenue, in this city. About the same line of perfumery, tooth brushes and articles of virtu (or virtue) to be found there every year are thrust before the visitor, with the invitation to purchase, as he walks through the main hall on the way to the machinery department.

Although this department does not present as much material of interest to the intelligent mechanic as a first-class machine shop, there are exhibits this fall worthy of particular attention. Power is furnished by two horizontal engines—the Buckeye, supplied by steam from the Lowe boiler, and the Whitehill engine, from Newburgh, N. Y. About the close of the present month, an expert test of the Buckeye engine and Lowe boiler will take place.

The greatest novelty in steam engines is exhibited in operation by Dunbar, of Buffalo. It is a "tri-cylinder" motor, and takes up but little space for a given nominal horse power. It has no dead center, can be reversed instantly when under full speed, and can be started and stopped with the crank in any position. One peculiarity is that it can be hung on the ceiling as a hanger, or upon a wall, and can be worked in any position desired. It can be speeded very highly. F. C. & A. E. Rowland, of New Haven, have running one of their neat and attractive vertical engines. It runs very smoothly, without noise or jar. In giving it the finishing touches, they evidently have fallen in with the same idea "Chordal" advanced last week in his dissertation on painting machinery.*

The Herreshoff compound condensing engine is exhibited for the first time at this fair; also the Herreshoff coil boiler. The former is intended principally for steam yachts. The boiler is a succession of coils fired from the center. It is covered with an outside casing of brass, gets up steam very quickly, has hardly more than half the weight of ordinary boilers, and is said to be very economical. The Otto Silent Gas Engine is exhibited, but had not been started when we saw it. Almost everything in the machinery department seems to be behind time getting in order. Several of the spaces are empty, though we are informed every foot of available room has been assigned to exhibitors.

The only machines on exhibition that can properly be classed as machinists' tools, are an engine lathe and an iron planer, shown by Smith, of Smithville, N. J. He also displays a resawing machine of new design. It saws stuff as thin as a sheet of paper. The feeding rollers are pivoted so they will adjust themselves to any inequalities of the wood, also admit stuff with one thick and one thin edge (beveled). Guides are arranged so as to make its working very steady. Wm. Main, Piermont, N. Y., shows the practical working of his milling attachment for lathes, illustrated in the American Machinist, Sept. 13.

The newest thing we noticed, belonging to machinery, is a dynamometer pulley by A. Campbell, 19 Beekman St., New York. By the side of an ordinary looking pulley is a stationary plate through which the shaft passes, and to which a graduated scale is attached, to show the number of pounds strain on the belt, and the horse power exerted at any time

The interior mechanism consists of a spring which, as the pulley revolves, causes a reciprocating motion of the little arm attached to wheels behind the dials. As the strain increases on the belt, it also increases the reciprocating motion, which causes the wheels to move more rapidly. By placing this on the main shaft, and connecting all the machinery, it will determine how much power it takes to drive the whole. By dropping off one machine at a time, the power required to drive each may be found. This will also show the friction on the lines of shafting, and will throw some light upon the value of lubricants. A good dynamometer is a valuable thing to have about a machine shop.

The Farrel Foundry and Machine Co. exhibit an improved stone crusher, after the Blake pattern, which munches up the hardest rocks that are placed in its jaws with apparent ease.

Hours for Daily Labor.

"A writer in the *Atlantic Monthly* says: I believe that for most men more than eight hours' work per day is required for the maintenance of physical, mental, and moral health. I think that for most men, including operatives, mechanics, farmers, and clergymen, more than eight hours' labor per day is necessary, in order to keep down and utilize the forces of the animal nature and passions. I believe that if improvements in machinery should discharge men from the necessity of laboring more than six hours a day, society would rot in measureless and fatal animalism. I have worked more than ten hours per day during most of my life, and believe it is best for us all to be compelled to work. It would be well, I think, if we could make it impossible for an idler to live on the face of the earth. Religious teachers are not without responsibility for having taught that the necessity of labor is a curse. The world owes most of its growth hitherto to men who tried to do as much work as they could. Its debt is small to the men who wished to do as little as possible."

The above is all very well as far as it goes, but it don't go a great ways. We will agree that more than eight hours work a day is necessary, but the labor should be varied, for if any man applies himself to study and does no manual labor, he will very soon break down. In order that a man may keep his body and mind in the highest state of efficiency he must exercise both.

We are acquainted with a class of mechanics near this city who labor ten hours per day. They must leave home at 6 o'clock in the morning and do not return until 6.30 in the evening. Where is the time in which those men may improve themselves by study?

In the shops where they are employed they are not allowed to read during working

hours. The best system of labor was first introduced by Solomon, King of Israel, who divided the twenty-four hours of the day into three equal parts, whereby was found eight hours for intellectual improvement, eight hours for the usual avocations or labor, and eight hours for refreshment and sleep. A better system was never inaugurated, before nor since. The life of a man placed in a situation like the mechanics referred to, shrink to the monotonous duties of working, eating and sleeping, or, as one of their number summed it up to us the other day, "I go to work in the morning and go home at night and stay there." This is a fair specimen of the ambition of a man who does too much of one kind of labor. The world indeed owes its progress to men who labored hard and did—what? One kind of work? No; but to those who used their brains to devise and hands to construct the appliances which are to day indispensable. We do not encourage laziness, and we think that the writer of the accompanying extract must be groping his way about in the dark, trying to find the way out of his present position, for he seems to see only the dark side. The mechanic should have time in which to improve himself, and those who are inclined to spend their leisure time in gin mills and lager beer saloons will do so even if they had to work sixteen hours a day. From this class the world cannot expect much, but the ambitious and enterprising mechanic should have time and opportunity for self-education as well as for recreation. It is doubtful if the writer of the above extract was ever obliged to do ten hours hard manual labor from day to day in the course of his whole existence. If he had been, it is unlikely he would come to regard workmen as mere automatic machines.

As Others See Us.

(*From the Cleveland Daily Leader.*)

The AMERICAN MACHINIST—a journal for machinists, engineers, founders, boiler makers, pattern makers, and blacksmiths. The AMERICAN MACHINIST was changed quite recently from a monthly to a weekly publication, the subscription price being now three dollars per annum, or six cents for a single number. It is an indispensable companion for men engaged in the pursuits mentioned in its title, as well as a very valuable source of information for the general reader. Engravings of the finest character are liberally furnished whenever necessary for the illustration of an article, or the description of a new invention, or a new machine. The paper is excellent, the type beautifully clear, and the printing, especially of the engravings, equal to the best book work. Machinists and all engaged in the handling and working of machinery, will find in its pages the best information as to the current progress in the mechanic arts, while the editorials are well written articles upon topics of vital interest to the people generally.

(*From the Phrenological Journal.*)

THE AMERICAN MACHINIST.—This bright, spicy, sensible quarto weekly, devoted to practical mechanics and engineers, is one of the best, carefully written, well illustrated, and full of real merit. An article, "Use and Abuse of the Engine Lathe," is worth a year's subscription. Its editorials also have the true ring; one in particular, "Kid-Glove Naval Engineers," is a sharp criticism, and overhauls without gloves the U. S. Naval academicians.

Letters from Practical Men.

Editor American Machinist:

I reply to "A Moulder," who asks how to keep a column straight when moulded from a straight pattern: First, the pattern ought to be made out of true enough to counteract the spring in cooling of the casting. If this is not the case, the most the moulder can do to remedy it is, after "shaking out," uncover the middle of the casting on the cope side, for two feet or so, leaving the ends covered, and weigh the ends down. This will generally answer the purpose.

V. HOOK.

Editor American Machinist:

In your issue of Sept. 20th, V. Hook gives this table of cut-off and commencement of exhaust, and it is not correct.

TABLE.

Valve $\frac{5}{8}$ lap—5 in. travel—Link motion.

V. HOOK'S.		LINK'S.		
Cut-off.	Commencement of Exhaust.	Cut-off.	Commencement of Exhaust.	
4	$12\frac{1}{4}$	4	17	Valve line and line inside.
6	15	6	18	
8	$16\frac{1}{3}$	8	19	
$10\frac{1}{8}$	18	10	20	
$12\frac{1}{16}$	$18\frac{9}{16}$	12	$20\frac{1}{2}$	
15	$20\frac{1}{2}$	15	$21\frac{1}{2}$	
18	$21\frac{3}{4}$	18	$22\frac{1}{2}$	
		$22\frac{3}{8}$	$23\frac{3}{16}$	

I wish V. Hook would explain how a valve having $\frac{5}{8}$ tap, 5in. travel, can cut-off at 18in. I suppose V. Hook's valve had inside clearance, if so, he should have stated it and the amount. The left hand table is V. Hook's, the right hand table is mine, and is correct.

Chillicothe, O. LINK.

Business Specials.

Forty cents a line for each insertion under this head.

The Huntoon Steam Governor Co., of Lawrence, Mass., warrant a direct saving in steam of from 10 to 20 per cent. over any other Governor known; while for quick and accurate regulation, great durability and lasting economy in use, they guarantee results never before attained by any other. See advertisement.

Brown & Sharpe M'f'g Co., Providence, R. I., keep in stock at reduced prices Patent Cutters for the teeth of gears which can be sharpened by grinding without changing their form. All wheels of same pitch cut with them will run together correctly. Send for new catalogue.

National Steam Pump, simple, reliable and durable. Send for illustrated catalogue with reduced price list. W. E. Kelly, New Brunswick, N. J.

Castings, Gear Wheels and other parts of models, at lower rates than can be made by hand. Tallman & McFadden, 607 Market St., Philadelphia.

Three second-hand Boring Mills for sale cheap. One of 9 feet swing and two of 5 feet swing. These mills must be sold, and can be bought very low. Write for description. Fuller Trump, Springfield, Ohio.

Steel Stamping Letters, Figures, and Dies, 1-16 to ¼ Figures, per set, $1.00; ⅜ Figures, $3.00. American Tool Co., Cleveland, O.

Questions and Answers.

Under this head we propose to answer questions sent us, pertaining to our specialty, correctly and according to common sense methods.

(1) J. W. P., Evansville, Ind., writes: Will you please inform me on the following points? I have been engaged in repairing boilers and engines for a number of years and have wondered that we have no more explosions than we do. In removing a pair of horizontal boilers not long since, my attention was drawn to the leg of the mud drum by what appeared to be a leak; I took a hammer and attempted to jar off the dirt and scale, and to my surprise the hammer dropped through the iron which was no thicker than very thin tin, caused by corrosion. A few days previous to this discovery, we were carrying 120 lbs. of steam, thinking that we were perfectly safe in so doing. After this experience, I cautioned a brother engineer regarding mud drums set in solid brick walls. A few days after, he reported his boiler, in which he was carrying 95 lbs. of steam, to be in the same condition as mine was, and the iron was about the same thickness. I would like to have you give some reason why those boilers do not explode. Now, I know that if the iron above the water line was no thicker than in the cases mentioned it would not stand half that pressure, and yet we are taught by experts that the pressure is the same in all parts of the boiler, and if boilers explode with plenty of water (which, by the way, is seldom the case) those experts attribute it to the presence of some almighty foreign gas that common engineers do not know the name of. A. We would state, at the outset, that we do not believe in the application of mud drums to boilers, for they are dangerous enough without the addition of any superfluities. Mud drums are a receptacle for dirt, and corrosion commences in them from the time the boiler is first filled with water. We are acquainted with a case where there was actually a hole through the mud drum which was kept tight by a thin scale being baked on the sheet. We have also known the blow-off cocks to be opened with a boiler pressure of 60 lbs. of steam, and the water did not start. In another case, one of the hand-hole plates in the bottom of the boiler was removed and no water appeared, (there was a pressure of cold water on the boiler at the time). Sometimes the iron is corroded away in spots about the size of the hand, but is supported by the thick iron all about the edges. If the boiler is very dirty, the mud adds greatly to the strength of the lower parts. The teachings of practice are, that by applying gauges to the different parts of a boiler (as has been done) the pressure remains the same on all parts. In regard to the almighty foreign gas, we would say, that gasses are each designated in chemistry each by one particular name peculiar to itself, and when you hear the name of any of the foreign gases alluded to, please let us know and we will inform you if there are any such gases in existence.

(2) J. P. R., Allegheny City, writes: I am an apprentice at iron moulding, and know scarcely anything about steam engineering, but I would like to learn as much about it as I can. What I would like to know is, 1. In the foundry where I am working there is a 1200 lb. weight for breaking castings. It has a fall of 20 feet. What is the rule for finding the force with which it strikes? A. The rule may be found in Natural Philosophy, viz.: The weight multiplied by the velocity will give the force of blow. A body will fall 16 feet the first second, and will have gained a velocity of 32 feet, and therefore commences the second second, and, as gravity is a constant force, gains 32 feet more during the second, making 64 feet, which equals 4×16 feet. It commences the third second with a velocity of 64 feet, and gains 32 feet more, making 96 feet, which equals 6×16 feet. The mean between 64 feet, the velocity at the beginning of the third second, and 96 feet, the velocity at the close, is 80 feet, which equals 16×5 feet. Hence the rule, viz.: In any succeeding second the velocity is 16 feet, multiplied by the corresponding even number 4, 6, 8, etc., and the distance is 16 feet multiplied by the corresponding odd number 3, 5, 7, 9, etc. The odd number corresponding to any second is easily found by doubling the number of the second and subtracting one from the result. In any number of seconds a body falls 16 feet multiplied by the square of the number of seconds.

2. The description of the steam fire engine in the issue of August 23, contained the following sentence: The standard engines built by this company have sectional areas of water pistons, as follows: It also mentions sectional area of pumps. What is meant by sectional area? A. Sectional area in this case means the area of piston, and applied to pumps means area of water piston. 3. What is the advantage of an automatic cut-off over the old style of governor and throttle with fixed cut-off? A. An answer was given to a similar question in our issue of September 13th, 1879, question 2. The automatic cut-off will cut off the steam in the cylinder in proportion to the load upon the engine, whereas the fixed cut-off will cut off at the same point continually. 4. What is back pressure? A. Back pressure in the cylinder of a steam engine is a resistance on the opposite side of the piston to which the steam acts, and may be caused by lap on the inside of valve; too early exhaust; choked or insufficient size of exhaust, etc. 5. What is meant by re-evaporation? A. The process which takes place in the cylinder of re-evaporating the water condensed during the working of the engine. There are numerous opinions among engineers, as to the best way to accomplish this end. 6. Will there be an index to the AMERICAN MACHINIST, Vol. 1, printed? A. We did not print an index to Vol. 1, but will hereafter publish an index at the end of every volume.

(4) A. P., Newark, N. J., writes: Please inform me the best method of removing rust from the inside of a small cast iron boiler. A. You do not state whether or no the boiler is in use. If it is we would advise you to put some kerosene oil into it, which will loosen the rust. It is advocated by some engineers to prevent the formation of scale, as it will not come out of the boiler until the water is blown off. If the boiler is not in use, saturate the inside well with the same oil, which will accomplish the desired result.

(5) C. S. B., Troy, N. Y., writes: 1. What is the meaning of expanding pitch as applied to the screw propeller? A. It is understood to be the increase in the pitch of the screw from the hub towards the periphery of the wheel. 2. What is the fraction of pitch employed? I do not find a satisfactory explanation of either in any books I have access to. A. The whole pitch is one complete revolution of the screw, and by the fraction of pitch employed is meant the amount of that pitch used, and refers to the width of the blades of the wheel as compared to the whole pitch.

(3) J. S., New York, writes: What is the horse power of an engine 16 in. cylinder and 24 in. stroke, running 100 revolutions per minute, boiler pressure being 100lbs. per square inch, cuts off at half stroke? A. If your engine is well proportioned and properly built, under the most favorable conditions, it ought to develop 108 H. P., but this only an approximation, for we have known an engine to have a cylinder capacity sufficient to develop 100 H. P., when by applying an indicator it was found to be only doing about 25 H. P. To get the H. P. of an engine. Rule.—Multiply the area of piston in square inches by the mean effective pressure in the cylinder (which in practice may be roughly estimated at one-half the boiler pressure) by twice the length of the stroke in inches, by number of revolutions per minute. The result divided by 33,000 will give H. P. required. It is customary with most engineers to deduct 13.1 per cent. from this quotient for friction. For further information, see Useful Information for Engineers, by Stephen Roper, contained in our issue of September 20th, 1879.

MANUFACTURES

McDonald & Co., of Chicago, are erecting a fine three-story building to be used for steel manufacturing purposes.

The Keith Paper Company, Turners Falls, Mass., contemplate the enlargement of their mill some time during the coming year.

The machine shop on Dexter street, Pawtucket, R. I., has been leased by Willmarth & Mackillop.

A glucose factory now in the course of erection at Peoria, Ills., will cover a space 300x140 feet, seven stories high.

The Star Mills, Middleboro', Mass., have shut down to put in a wheel which will carry their whole run of machinery at any time. Its cost will be $5,000.

Only two mills in Pittsburgh are now using natural gas as fuel, though when the experiment was first made it was supposed that it would quite generally supersede coal.

The machine shops in Indianapolis are all overcrowded with orders. No such rush of orders has been made upon them for ten years past.

Louis Houck, file manufacturer, St. Louis, Mo., has invented a file-cutting machine which is said to make excellent files with great rapidity. The cost of one machine is $1200.

The Hamilton Company, Lowell, Mass., is putting in the foundation for a big mill, 365 by 75 ft., six stories, with L, 75x75 ft., same height.

The National Tube Works Company, of Pittsburgh, will replace the buildings which were burned down recently, by an iron structure, which will be fire-proof.

The Pratt & Whitney Company, of Hartford, are running full with a force of 450 hands, 150 of which have been added within the past three months.

Work is so active, and orders so plenty at the iron works of Troy, N. Y., that certain manufacturers have advanced the pay of their workmen.

Eastern capitalists have purchased, and are now repairing the Pennsylvania Rolling Mill, at Lancaster, Pa., and will soon put it in operation.

The Keystone Bridge Company, Pittsburgh; Pa., have a full force of hands employed (about 400), who work until 10 o'clock at night.

The Chicago Steel Casting Co., a new establishment, are just finishing a new foundry about 50x150, specially adapted to their business.

Jas. Thorn & Co., Pittsburgh, Pa., are making four batteries of boilers for as many different companies who have boats on the Magdalena river, U. S. of Colombia.

The Eames Iron Works, at Titusville, Pa., are working a force of twenty-five hands, and consume about one barrel of petroleum for every ton of iron manufactured by their new process.

The Co-operative Iron and Steel Works, of Danville, Pa., are running full time on 48-pound rails for the New Mexico & Southern Pacific Railroad, with orders ahead for the rest of the year.

The Miller Chain Works, at Cuyahoga Falls, Ohio, formerly the Matherson Chain Works, are to be removed to Akron—the Messrs. Miller having leased Chevrier's old Akron Chain Works for the purpose.

An unusually large planer for iron work has been shipped from the machine shop of David W. Pond, Worcester, Mass., to parties in Lowell. It weighed 31,800 lbs., and measured 30 by 42 feet, and was 28 feet long.

The Cleveland Co-operative Stove Company have just completed the extensions and improvements to their works on Garden street, at the junction of the Cleveland and Pittsburg Railway, which have been in progress for some time past. These extensions make their foundry one of the largest and most complete in the State.

A new shoe factory is talked of at Sandwich, Mass.

The Abington (Mass.) Tack and Machine Association are filling the fourth order for machines from one firm in Lisbon, Portugal.

Munn's foundry, at Northampton, Mass., will be removed to Holyoke in about two months.

The Buckeye Works, Akron, O., are to be further enlarged by a new wing on the side of the old shops, so as to equal in width the new addition. The roof of the new building will also be removed and another story added, to be used as a paint shop.

The Grape Sugar Company of Buffalo, offers, through the *Express* of that city, a reward of $10,000 for "any appliance to our boilers that will consume smoke and not diminish the quantity of steam now obtained." The Firmenich Boiler is made by the above company.

The Fairmount Machine Works, Thomas Wood, Philadelphia, are fully employed, and 100 looms are just being shipped to the Tuscaloosa Cotton Mills of Alabama.

The following item is going the rounds of the press:

"The Corliss engine of Centennial fame is now used to run the machinery of the branch mint at San Francisco."

The Corliss Centennial Engine (1400 H.P.) used to drive the machinery in Machinery Hall during that Exhibition, was taken apart at its close, and is now stored away in the Works of the Corliss Steam Engine Co., Providence, R. I. There is a prospect that it will be used to run the mechanical part of the coming World's Fair in New York, in 1883. A Corliss engine runs the machinery of the U. S. branch mint in San Francisco.

The increase, both in kind and quantity of manufacturing machinery that is made in Paterson, N. J., has been considerable within the past few years, and very much that was formerly exclusively imported is now successfully produced here. Perhaps the most marked instance of this is seen in the works of Benjamin Eastwood, a young man who has, in the last seven years, built up a very flourishing business, principally on work that had not been undertaken here before. This has been largely in the line of silk machinery for which the works are well reputed. A new foundry has just been built, and the castings will be made by his own help hereafter.—*Boston Com. Bulletin.*

The Peters' Combination Lock Company, about starting a factory in Moncton, N. B., absorbs a company of the same name formed a year or two ago and having a factory at Westbury, Conn. The capital of the new company is to be $200,000, of which $22,000 is said to be now subscribed.

Saturday, the bench moulders in the employ of the Co-operative foundry company, says the *Troy Evening Standard*, Sept. 23, drew up a petition and presented it to the superintendent asking for an equalization of prices, as paid in other foundries in this city. The superintendent said he would let the men know on Monday morning. This morning a committee of the moulders went into the office and asked for an advance. It was refused them and they immediately struck and left the shop. This foundry was first built in opposition to other foundries in the city during the strike of 1866, and we are surprised that those men should be in league with the other manufacturers to cut down wages, as all are working men.

E. P. Allis & Co., of Milwaukee, Wis., have the contract to furnish machinery, 24" ×48", engines and plans for the large elevator now being built by the Minneapolis Elevator Company. The elevator will be capable of holding 1,000,000 bushels of wheat.

The John A. Roebling's Sons Co., Trenton, N. J., manufacturers of wire and wire rope, now employ 500 hands, and will soon have to increase their force. The concern lately turned out a heavy wire rope 5,870 feet long, which weighed 62,000 pounds, and cost $10,540.

The Dwight Manufacturing Co., Chicopee, Mass., are having the Jarvis Furnace applied to two of their boilers. These boilers were built by Hawkins & Co., of Springfield. The No. Adams Woolen Co. are also applying the Jarvis Setting to their boilers.

A new four-story carpet factory is in process of erection by Joseph Taylor, on the corner of Berks and Howard Streets, Philadelphia. In addition to the ten Murkland power-looms now running, twenty more have been ordered for his new mill. The old mill has been sold to his brother, Thomas Taylor, who proposes putting in ten Murkland looms. —*Carpet Trade Review.*

Work on the new pulp mill site at South Holyoke, Mass., is being pushed vigorously.

The Striking moulders in Paris' foundry, at West Troy N. Y., have resumed work at the former prices.

The Nixdorff Chain Works employ 125 men. This, together with the large works of Franz Krein, makes St. Louis one of the largest chain manufacturing centers in the United States. For many years very few chains were manufactured in the United States, and the prejudice against American manufactures was so strong that it required many years to even get the trade to consider domestic goods. Until two years ago, the bulk of the chains used in the United States were imported from England, but the American goods have at last surpassed those of English manufacture.

The Bolt and Nut Works, of the Lake Erie Iron Company, Cleveland, O., were started recently under very favorable circumstances. New and spacious buildings have been erected, and the company expects to have full employment for not less than 100 men.

The steamer Lord Clive, sailing from Liverpool, Sep. 19, took out thirty engineers and machinists for Philadelphia from Bradford and that district, and an order has been received from a Philadelphia firm for the engagement of 100 riveters.

The Cuyahoga Steam Forge Co., Cleveland, O., are working over time, and have plenty of work on hand. They are now shipping to the Chicago Union Rolling Mill a pumping engine weighing forty-five tons, one of the largest they have ever made.

The extensive Machine Works of the New Castle Manufacturing Company, at New Castle, Pa., have been leased by Messrs. Wadington, McConnell & Stephenson, and are now in full operation, with a good prospect ahead.

The Benedict & Burnham Manufacturing Company, of Waterbury, Conn., are running full time, and employ 350 hands. Their specialties are brass and German silver, wire in sheet, a great variety of wrought brass butt hinges, lamp burners of all kinds, etc.

D. E. Saltonstall & Co., Toledo, O., manufacturers of Notman's patent engines and pumps, are about to enlarge, by the addition of adjoining rooms, to nearly double their present capacity. They are very busy, and far behind their orders.

The new machine shop, which Messrs. Whitehead & Atherton are erecting near their foundry at Tewksbury, Mass., will be of brick, 200 by 45, and two stories in height. Connected with it will be a blacksmith's shop 40 by 30, and an engine house 30 by 24, also of brick, one story in height.

At Phillipsburg, N. J., the largest iron manufacturing town in western New Jersey, fully one thousand men find employment in the mills alone. The Warren Foundry, which six months ago was running on short time with not one hundred men at work, is now employing over four hundred men, beside having introduced new machinery which does away with the employment of many men.

A paper mill will soon be erected at Menominee, Mich. It will cost in the neighborhood of $40,000, and will contain five turbine wheels with 663 horse-power, four pulp machines, four heating engines and one 48-inch Fourdinier paper machine. Fifty skilled laborers will be employed and print paper exclusively manufactured.

Strikes are on the increase, and seem to succeed oftener than they fail. The American Iron Works, Pittsburgh, employ 5,000 men, and have had a number of strikes in different departments, within three weeks. Nearly all the men in their mills have had an increase of wages, which settles the difficulty for some time to come. Moulders have obtained an advance in many parts of the country, some by striking, and some by asking for it without a strike. The trunk-makers of Newark, N. J., went on a strike which was terminated by giving them an advance of 20 to 25 per cent. We are gratified to observe that many iron makers have voluntarily advanced the wages of their workmen, thus allowing them to share in the increased prosperity of the trade.

We noticed while in the shops of Kendall & Roberts, Cambridgeport, Mass., a few days ago, several new machines going into place in an addition to the shops, just erected. They are crowded with orders. Have now under way seventy to eighty engines of different patterns and sizes. Their "Favorite" engine is a new one, having a high piston speed, and is well designed. They have recently sent eight of them to Honalulu, Sandwich Islands.

John L. Jackson is building a machine shop and foundry in Saginaw, Mich., 100 ft. square, and a pattern shop 50 ft. square.

The Rhode Island Locomotive Works, Providence, R. I., are running some departments 24 hours a day. They have nearly 900 men at work. While in their shop, recently, we noticed a locomotive building for the St. L. K. C. and N. R. R., which will weigh (without water) 71,380 pounds.

The Boston Bridge Works, Cambridgeport, Mass., have 25 men at work. They have contracts to build a bridge and a depot roof for the Lowell R. R., at Lowell, a roof for the Custom House at St. Johns, N. B., and for a number of small bridges.

The white lead and oil works of D. B. Shipman & Co., at Chicago, are undergoing extensive alterations.

A new silk mill is to be built at Union Hill, N. J.

The foundry and machine shops of S. C. Forsaith & Co., at Manchester, were not affected by the recent fire which destroyed their planing mill, and are running as usual.

Collins & Burgie have resumed operations at their Chicago stove works, giving employment to 200 hands.

The pipe welders at the Crescent Tube Works, Pittsburgh, have had their wages increased twenty-five cents per day, the increase being voluntary on the part of the firm.

The proprietors of the Philadelphia iron mills have again voluntarily advanced the pay of their puddlers, this time from $4 to $4.25 per ton.

The moulders employed by Carr, Crawley & Devlin, Ninth and Jefferson streets, Philadelphia, one of the largest malleable iron and general hardware manufactories in the country, have succeeded in getting an advance of from a quarter of a cent to four and one-half cents per mould, according to grade, over rates heretofore received.

Iron Review.

New York, Sept. 26th, 1879.

We are called upon this week to record a general advance in prices of iron and steel, and it is to be noted that this is the first advance in steel since the rise in iron set in, and while there would seem to be more room for continued advance in steel than iron, yet the latter will be no lower, and has still a decidedly upward tendency. We do not look for any lower figures this year.

Pierson & Co., 24 Broadway, furnish us the following quotations to-day:

Prices out of store are as follows: No. 1 X Pig Iron, $28 per ton; Iron Rails, $45 to $50 per ton, according to weight; Old Rails, $28 to $29 per ton; Fish Plates, 2 8-10c. per lb.; Railway Spikes, 3½c. per lb.; Bolts and Nuts, 5½c.; Common Iron, 2 8-10c., basis from store; Refined, 3c. basis; Ulster, 3½c. basis. Machinery Steel, 6c.; Best Tool Steel, 12c.; Norway Bar Iron, 5c.; Norway Shapes, 5½c.; Nail Rods, 6c.; Sheet Iron, 4c.; Angle Iron, 3¼c., Tee Iron, 3 3-4c.; Band Iron, 3 3-10c.; Hoop, 3¼c., up; Horse Shoe, 3 6-10c.; Tank, 4c.; C No. 1, 4¼c.; C H, No. 1 Shell, 4¼c.; Best Flange, 5¼c.; Boiler Rivets, 4 3-4c. per lb.; Hot Polished Shafting in lengths two feet and longer, from 7c. to 8c. per lb., according to size. Small Black Rivets, 50% off in papers, 35% off in bulk.

Machinists' and Engineers' Supplies.

Business is good and likely to remain so. Many houses are withdrawing all quotations, as prices are inclined to advance on several lines of goods, and it is impossible to predict how soon the changes will take place.

The American Screw Co. issue a circular quoting Coach Screws per keg 65% discount from list; black and tinned rivets, 50% discount; rivets in bulk 35% discount. They also issue the following circular on Machine Screws:

Providence, Sept. 20, 1879.

To the Hardware Trade: We ask your attention to an important reduction in our prices for Machine Screws, and to a change in price list. We have now adopted the list in use from May 20, 1856, to April 20, 1864, and while we have screws in stock will sell at the following discounts:

	Dis. from list.
Flat Head Iron Machine Screws	65%
Round " " "	60%
Flat Head Brass " "	35%
Round " " "	20%
Taps for Machine Screws (per doz.)	45%

This reduction is made to induce a larger consumption of our product, and to give employment to new machinery we are now constructing. If the demand under present quotations exhausts our stock, we shall advance prices to more remunerative rates.

We think the present offers a good opportunity for those contemplating the purchase of a stock of Machine Screws, and in execution of orders at the above prices we shall endeavor to give old customers, in other goods as well as Machine Screws, the preference. Awaiting your orders, we remain, yours, very respectfully, American Screw Co.

The following circular has been issued by the Nicholson File Co.:

Notice.

Owing to the disposition of some of the leading buyers to order exclusively, we find ourselves becoming so heavily loaded with orders as to greatly embarrass us in supplying the wants of the larger number While we have no desire to change our prices before January 1, 1880, unless compelled to, we deem it for the best interest of all to advise you:

That all orders hereafter received will be subject to ruling rates at time of shipment, without further notice.

We shall hereafter accept orders only to the extent of our ability to fill them; and any unfilled orders remaining on our books at time of any change will be continued (in the absence of special notice to contrary) to be executed as fast as possible at such new rates.

Nicholson File Company,
W. T. Nicholson, President.
Providence, September 18, 1879.

Situations Wanted—Help Wanted.

We will publish notices suitable for the above headings, applying to any of the machinery trades, and not to exceed four lines each (32 words), at the nominal rate of twenty-five cents for each insertion.

A practical machinist and engineer of many years' experience as foreman and draughtsman, desires employment, or will take the agency of machinery of merit. Address "Foreman," office American Machinist, 96 Fulton St.

A Book-keeper—German, of middle age—having many years experience and knowledge of the French language, also in possession of A No. 1 references of best city houses—is open for an engagement, either as such, or in any capacity. No objection to country. Address, B., care American Machinist, 96 Fulton street, New York.

A first class mechanical draughtsman, thoroughly practical, well educated, desires a situation in New York, or vicinity. Can be highly recommended. Address, Draughtsman, office of the American Machinist, 96 Fulton St., N. Y.

RICHARD DUDGEON,
24 Columbia Street.
NEW YORK,
Maker and Patentee of
IMPROVED HYDRAULIC JACKS,
Punches, and
Roller Tube
Expanders,
AND
DIRECT ACTING
Steam Hammers.

Communications by letter will receive prompt attention.

Jacks for Pressing on Car Wheels or Crank Pins made to order.

NICHOLSON FILE CO.

SOLE MANUFACTURERS OF

FILES AND RASPS

HAVING THE INCREMENT CUT.

Also, FILERS' TOOLS and SPECIALTIES.

"Nicholson File Co's" Files and Rasps.
"Double Ender" Saw Files.
"Slim" Saw Files.
"Racer" Horse Rasps.
Handled Rifflers.
Machinists' Scrapers.
File Brushes, File Cards.
Surface File Holders,
Vise File Holders.
Stub Files and Holders.
Improved Butchers' Steels.

Manufactory and Offices at **PROVIDENCE, R. I., U. S. A.**

BOSTON NUT CO.

MANUFACTURERS OF

FINISHED NUTS

(Case Hardened.)

Set, Cap and Lag Screws, Bolts, Nuts and Washers.

92 & 94 Broad St., Boston, Mass.

C. W. LeCOUNT,

SOUTH NORWALK, CONNECTICUT.

Manufacturer of

LeCOUNT'S STEEL CHUCK DRILL HOLDERS.

They are of five sizes. The slot is rounded every way, so as to avoid corners that interfere with centering the Drill.

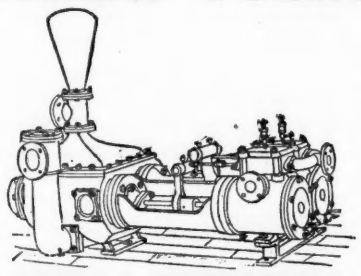
PRICES.

No. 1, Taking Drills from 3-8 to 9-16.....50c.
" 2, " " " 9-16 to 3-4.....50c.
" 3, " " " 3-4 to 1 1-8.....50c.
" 4, " " " 1 1-8 to 1 5-8.....75c.
" 5, " " " 1 5-8 to 2.....90c.

SET, $3.25.

SEND FOR DESCRIPTIVE CIRCULAR.

STEAM PUMPS.



HENRY R. WORTHINGTON,

239 Broadway, N. Y. 83 Water Street, Boston.

THE WORTHINGTON DUPLEX PUMPING ENGINES FOR WATER WORKS—Compound, Condensing or Non-Condensing. Used in over 100 Water Works Stations.

STEAM PUMPS for all purposes—Duplex and Single Cylinder.

PRICE LIST ISSUED JAN. 1, 1879, WITH A REDUCTION EXCEEDING 30 PER CENT.

WATER METERS. OIL METERS.

Soft, Strong and Smooth

CASTINGS

In *Gray Iron* and *Brass*, for small Agricultural Implements, Churns, Washing Machines, etc, either Plain, Galvanized, Bronzed or Japanned. Patterns and Models made to order. Send for estimates for Castings, etc.

LIVINGSTON & CO.

Iron Founders, Pittsburgh, Pa.

TOOL DEPOT. CHUCKS, VISES, FILES, EMERY GRINDERS, EMERY WHEELS, WIRE STEEL, BRASS, TAPS, DIES, MACHINE SET & CAP SCREWS, GEAR WHEELS, LATHES SHAPERS, DRILLS, SCROLL SAWS & SMALL TOOLS FOR ALL BRANCHES OF TRADE. SEND FOR CATALOGUE & STATE WHAT KIND OF TOOLS YOU REQUIRE. TALLMAN & McFADDEN. PHILADELPHIA.

HALL'S PATENT
DOUBLE COMPOUND LEVER CUTTING NIPPERS.

Price $1.25.

Sent by mail for 6 cents additional.

Every pair warranted.

Of the many Cutting Nippers heretofore placed on the market, not one has supplied either of the two great needs long felt by all who use them, viz.: 1st. Increased power without a clumsy and expensive increase of size. 2d. That the construction of the Nipper should be such that any damage to the cutting jaw or handle, from wear or accident, could be repaired.

All orders should be addressed to

PETER A. FRASSE & CO., Sole Agents, 95 Fulton Street, New York.

Scientific Books.

Send for new Catalogue, 1879, to

D. VAN NOSTRAND,

23 Murray & 27 Warren Sts.,

NEW YORK.

USEFUL BOOKS FOR PRACTICAL MEN.

DESCRIPTIVE CATALOGUE FREE.

E. & F. N. SPON, 446 Broome Street, N. Y.

A.F. PRENTICE & CO.

Manufacturers of

Light Machinists' Tools.

Improved Upright Drills, with Lever Feed and Wheel Feed with Quick Return Motion.

Hand and Foot Power Lathes.

SLIDE RESTS.

Special Machinery and Machine Jobbing.

FOOT POWER LATHES A SPECIALTY.

54 Hermon Street,

WORCESTER, MASS.

JARVIS PATENT FURNACE

FOR SETTING

STEAM BOILERS.

Economy of Fuel, with increased capacity of Steam Power.

The same principle as the SIEMENS' PROCESS OF MAKING STEEL, utilizes the waste gases with hot air on top of the fire.

Will burn all kinds of waste fuel without a blast, including screenings, wet peat, wet hops, sawdust, log-wood chips, horse manure, &c.

A. F. UPTON, General Agent.

Also Agent for the Mahony Patent Corrugated Grates, with 50 per cent. air space.

Send for Circular. *P. O. BOX 3401, BOSTON, MASS.*

Machinists' Supplies,

Railroad Supplies, Engineers' Supplies,
Mining Supplies, Boiler Makers' Supplies,
Steamship Supplies,
Mill Supplies, Fire Department Supplies,

W. S. MIDDLETON,

52 John Street, New York.

☞ *Estimates promptly furnished large buyers personally or by mail.*

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TOOL STORE,

No. 11 North 6th St., Philadelphia.

TOOLS for Machinists.
TOOLS for Jewelers.
TOOLS for Engravers.
TOOLS for Carvers.
TOOLS for Model Makers.
TOOLS for Cabinet Makers.
TOOLS for Amateurs.
TOOLS to Order.

This is the only exclusive TOOL STORE in Philadelphia.

MACHINISTS' AND FOUNDRY SUPPLIES,

Machinists' Tools, Drills, Belting, Taps and Dies. Also, **Steam Packing** of every description, and general assortment of supplies for

FOUNDRIES AND MILLS.

T. B. BICKERTON & CO.

No. 112 South Fourth Street,

PHILADELPHIA, PA.

S. C. FORSAITH & CO.,

MANCHESTER, N. H.

AND

213 CENTRE STREET, N. Y.

SPECIALTIES:

Abbe Bolt Machines,

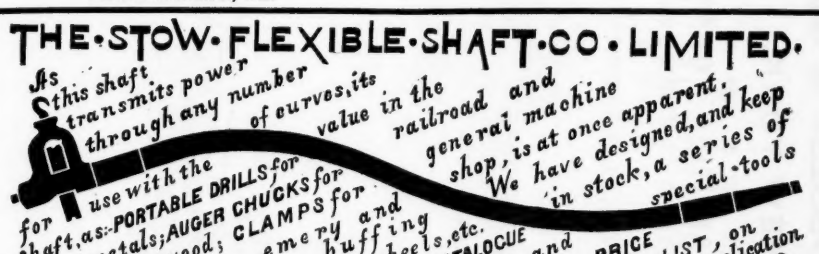
POWER HAMMERS,

Combined Hand Fire Engine and Hose Carriage.

NEW AND SECOND-HAND MACHINERY

Send stamp for Illustrated Catalogue, stating fully just what you want. Over 2,000 machines, new and second-hand; fully described, with prices annexed, in our List No. 20.

THE STOW FLEXIBLE SHAFT CO. LIMITED.


As this shaft transmits power through any number of curves, its value in the railroad and general machine shop, is at once apparent. We have designed, and keep in stock, a series of special tools for use with the shaft, as: PORTABLE DRILLS for metals; AUGER CHUCKS for wood; CLAMPS for emery and buffing wheels, etc.
CATALOGUE and PRICE LIST, on application.

500 NORTH FIFTEENTH ST. PHILADELPHIA.

Newell's Patent Universal Grinder.

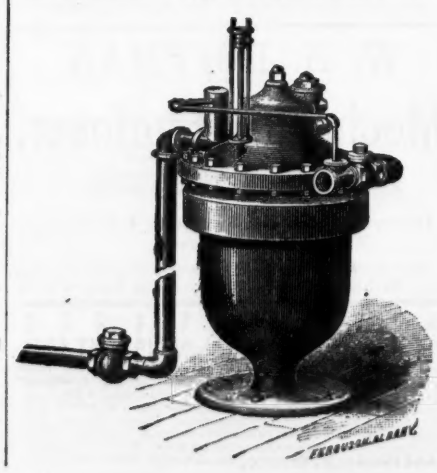
IMPORTANT TO MILLERS, MINERS AND MANUFACTURERS.

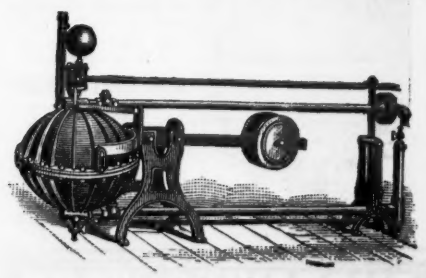
This Grinder is offered to the public as a machine which has no equal for grinding grain or pulverizing quartz, phosphates, bone, cement, oyster shells, scraps, glue, fire clay, and other articles of similar nature. It is unrivaled in the amount of work it will do in any given time and in the economy of power used. It is a point of great merit that our mill delivers a perfectly ***GRANULATED*** article. In grinding grain the meal ***IS NOT HEATED,*** and consequently may be bagged at the delivery spout with no danger of fermentation, and without the loss of weight incidental to the product when heated in grinding. It is estimated that the usual shrinkage is sufficient to cover the entire expense of grinding by this mill. We have ground, bolted for fine feed, through 13 mesh, weighed and bagged up ***six thousand five hundred (6500) pounds of corn per hour*** with not more than 15-horse power. It is compact, portable and not expensive. A cordial invitation is extended to all parties to call and see the machine at work at

Foot West 19th Street, New York City.

NEWELL & CHAPIN.

THE ALBANY STEAM TRAP.





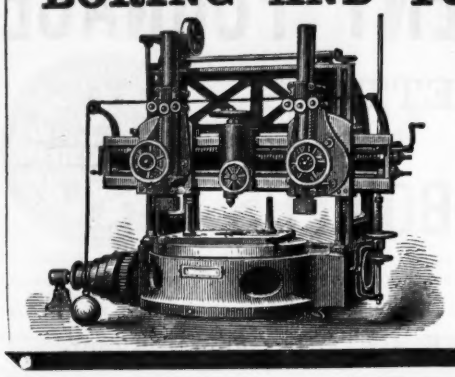
This Trap automatically drains the water of condensation from HEATING COILS, and returns the same to the Boiler, whether the coils are *above or below* the water level in Boiler, thus doing away with pumps and other mechanical devices for such purposes.

Apply to

Albany Steam Trap Co.

ALBANY, N. Y.

BORING AND TURNING MILLS.



All Sizes: 4, 5, 6, 8, 10, and 12 feet Swings.

PATENTED IMPROVEMENTS.

New Patterns.

MACHINISTS' TOOLS,

The Latest and Best, at very moderate prices.

NILES TOOL WORKS,
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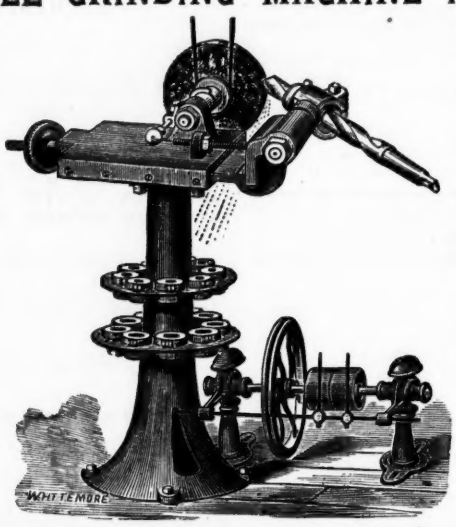

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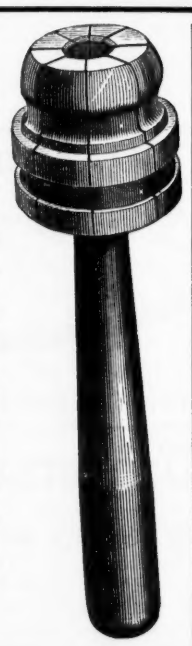

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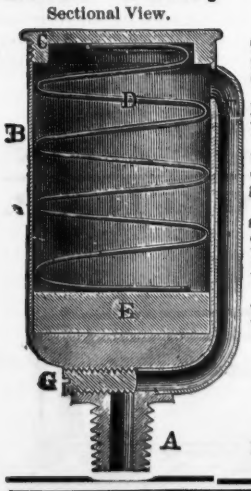

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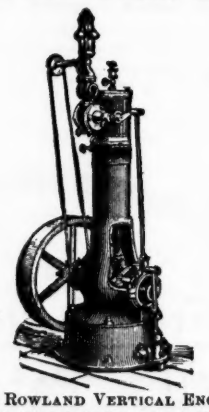

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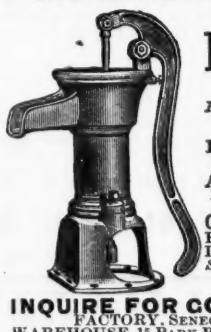

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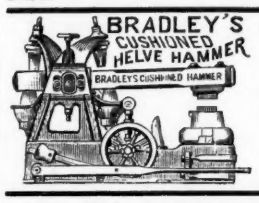

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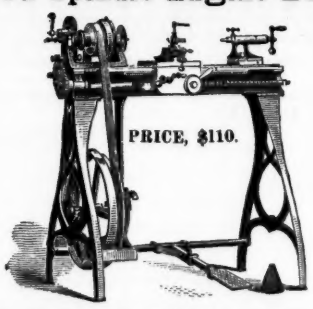

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Standard Gauges and Tools for Accurate Measurements.
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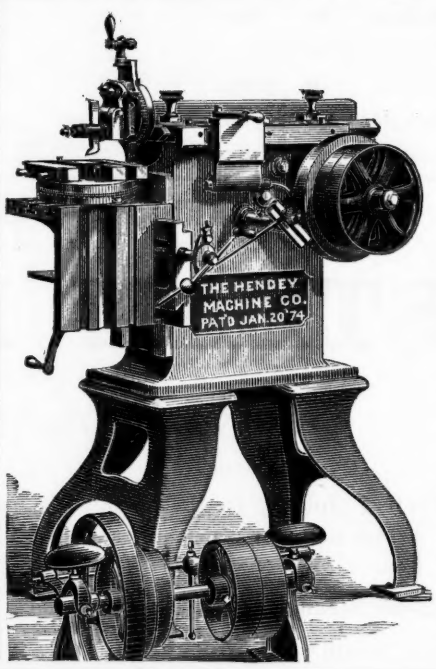

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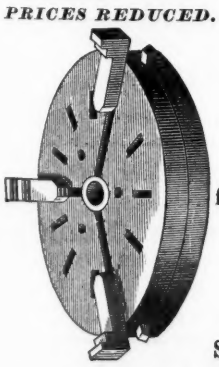

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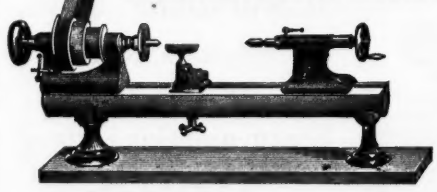

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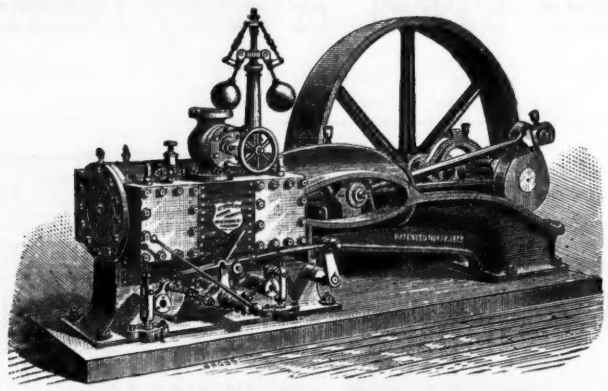

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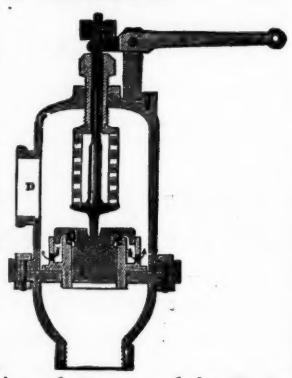

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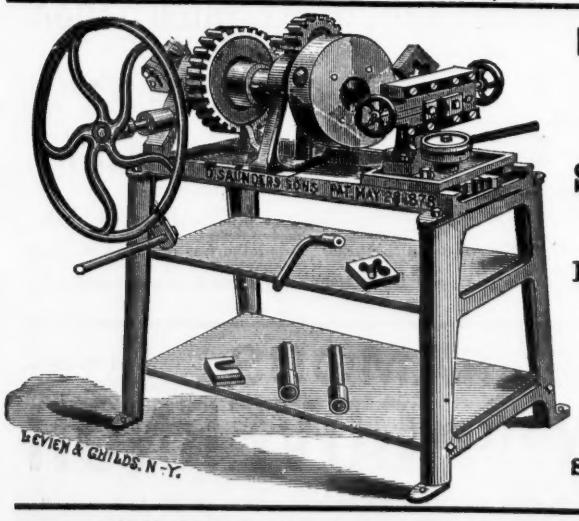

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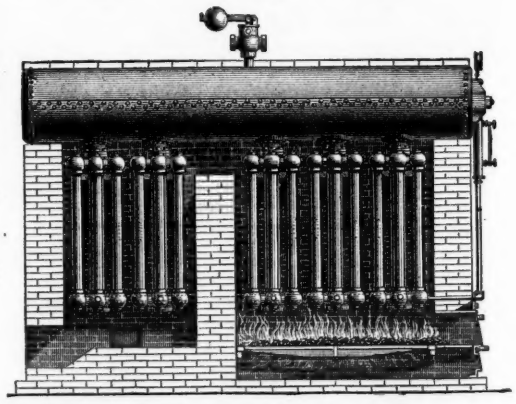

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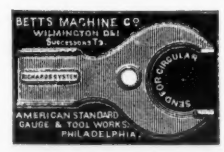

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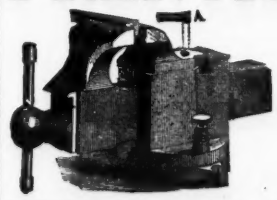

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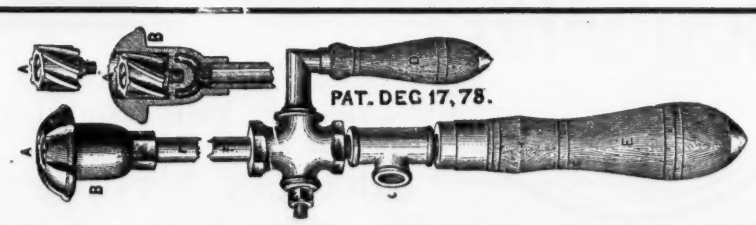

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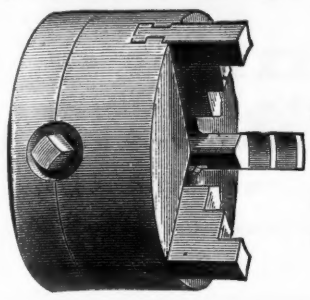

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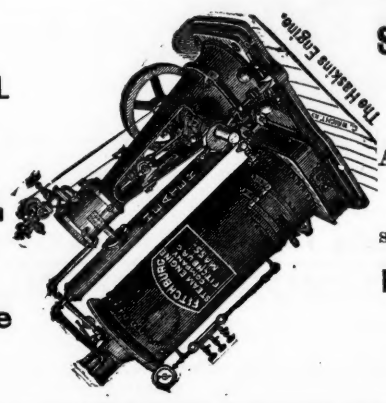

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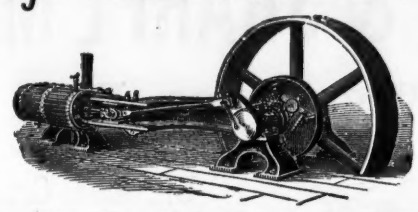

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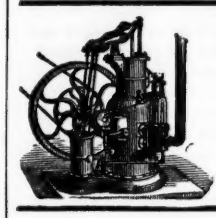

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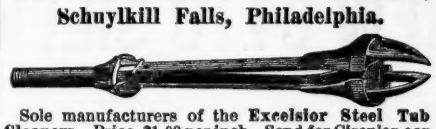

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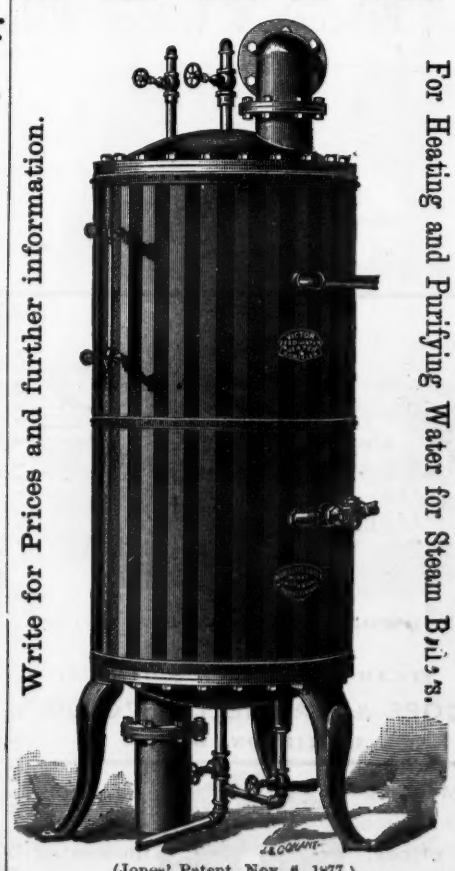

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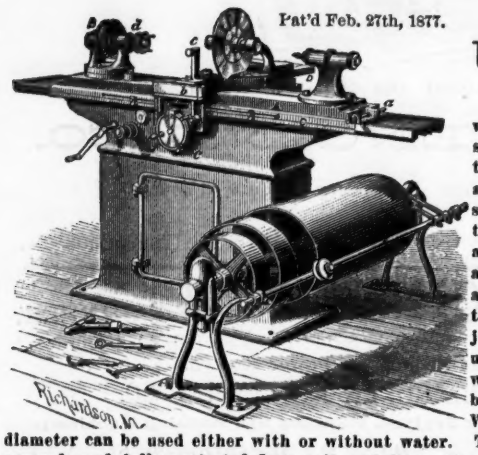

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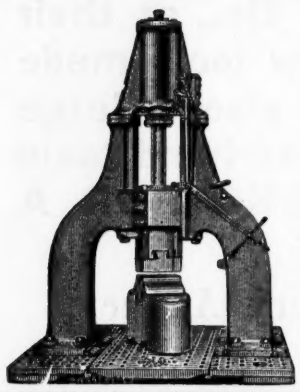

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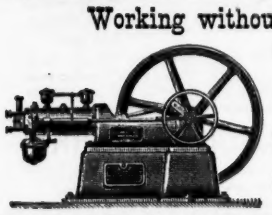

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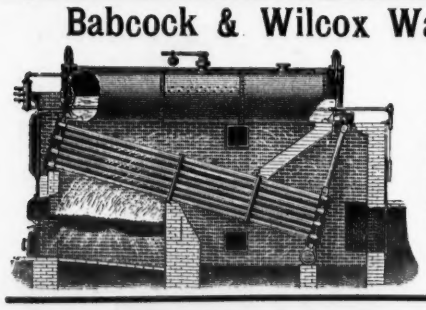

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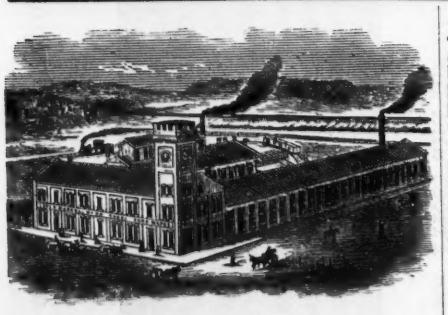

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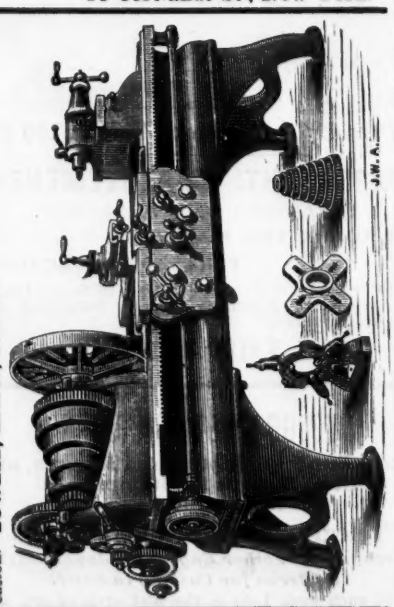

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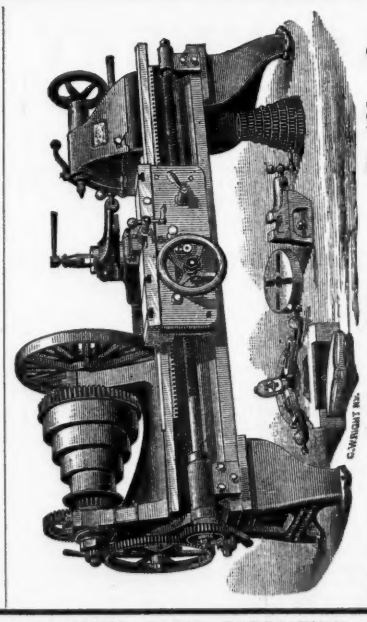

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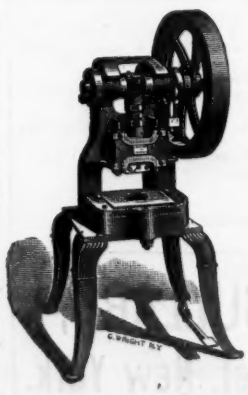

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